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ERRATA

page 8 line 28 for '237' read '238'
29 1 for 'Kemp H. H.' read 'Kemp, H. K.'
45 14 for '*Jap. J. Bot.*' read '*J. Jap. Bot.*'
69 9 for '*citrocarpa*' read '*citricarpa*'
117 22 for '722' read '723'
170 lines 43 and 44 for '*Botryoplodia*' read '*Botryodiplodia*'
176 line 13 for 'Colombia' read 'Columbia'
201 23 for '[Jensen (J. H.).]' read '[Kevorkian (A. G.).]'
215 15 for 'De Almeida (E.)' read 'De Almeida (F.)'
233 38 for '*avensis*' read '*arvensis*'
234 lines 20, 33, and 42 for 'the Argentine' read 'São Paulo'
43 for 'indigenous' read 'Argentine'
242 line 30 for 'Boyd (C. C.)' read 'Boyd (O. C.)'
248 46 for '*Oligostoma*' read '*Oligostroma*'
262 43 for '*andropogoni*' read '*andropogonis*'
288 26 for 'D. R. J. de Villiers' read 'D. J. R. de Villiers'
296 17 for 'proprionic' read 'propionic'
304 5 for 'in Ottawa' read '[in Winnipeg]'
336 42 for '*Terminalis*' read '*Terminalia*'
424 45 for '*saubinetti*' read '*saubinetii*'
556 15 for '*sexte*' read '*sexta*'
557 26 for 'Cifferi' read 'Ciferri'
560 7 for 'I. H. Baldwin' read 'I. L. Baldwin'
571 20 for '*annum*' read '*annuum*'
602 34 for '*Sclerotia*' read '*Sclerotinia*'
615 25 delete [*Leptosphaeria salvinii*]
616 16 for '*cyclopeum*' read '*cyclopium*'
672 lines 11 and 12 for 'dwarf' read 'top'
697 line 31 insert '(*Ustilago hordei*)' after 'smut'

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
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VOL. XIX JANUARY 1940

DOUGLASS (J. R.), WAKELAND (C.), & GILLETT (J. A.). **Field experiments for control of the Beet leafhopper in Idaho, 1936-37.**—*J. econ. Ent.*, xxxii, 1, pp. 69–78, 5 figs., 4 graphs, 1939.

This account of experiments in the control of the beet leafhopper (*Eutettix tenellus*) in Idaho during 1936–7 contains various references to the activities of the insect as a vector of curly top [*R.A.M.*, xviii, p. 225]. Unpublished data by N. J. Giddings have shown that, in general, the smaller the beet, the more susceptible it is to curly top, but the new resistant varieties have given evidence of appreciable resistance even in the seedling stage. Very little difference in leafhopper infestation on the non-resistant R[abbethge] and G[iesecke] (Old Type) and resistant (U.S. 12) beet strains was observed in the field in 1937 until 23rd June, when the former began to break down under the disease. U.S. 12 produced a relatively satisfactory yield in the test plots even under heavy leafhopper infestation (12·60 tons per acre compared with 0·64 for the Old Type).

YOUNG (H. C.). **Dusting and spraying Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1939*, pp. 13–20, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 9, p. 55, 1939.]

Leaf spot of sugar beet [*Cercospora beticola*: *R.A.M.*, xviii, pp. 721, 831] is commonly supposed to be serious only in one year out of five, but observations in Ohio over a ten-year period have shown that losses from this source may be expected almost annually. In 1937 they were particularly severe, entailing an average reduction of 2 to 5 tons per acre. Commercial control was obtained by three applications of a 6–8–50 Bordeaux mixture or fixed coppers (basic chlorides), the monohydrated copper sulphate and hydrated lime (20–80) dusts being less effective.

MAXSON (A. C.). **Beet root rot caused by Rhizoctonia solani.**—*Proc. Amer. Soc. Sug. Beet Technol., 1939*, pp. 38–45, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 9, p. 55, 1939.]

Sugar beet root rot surveys in Great Western Sugar Company territory in 1937 and 1938 indicated that 70·93 per cent. of the 970 cases of the disease reported were due to *Rhizoctonia*, probably *R.* [*Corticium*] *solani* [*R.A.M.*, xviii, p. 776]. The continuous cultivation of beets increased the incidence of infection, a similar effect being exerted by

potatoes preceding beets in the crop sequence, whereas maize and small grains greatly minimized the losses; no rot was present in 1935 in beet fields preceded by four years of grain.

WALKER (J. C.). **Disease resistant Pea varieties.**—*Canner*, lxxxviii, 12, p. 89, 1939. [Abs. in *Plant Breed. Abstr.*, ix, 4, p. 479, 1939.]

A fair number of pea varieties combining suitability for canning with resistance to common wilt [*Fusarium orthoceras* var. *pisi*: *R.A.M.* xviii, p. 777] are stated to be available, but new resistant types are required for the freezing industry. A high degree of resistance to 'near wilt' [*F. oxysporum* f. 8: loc. cit.] has hitherto been observed only in two canning varieties, Rogers K and Horal, themselves of little interest but of potential importance as parents in crossing. Breeding for resistance to root rot presents a highly complex problem owing to the implication in the etiology of the disease of several organisms [including (?) *F. solani* var. *martii* and *Aphanomyces euteiches*: loc. cit.].

HYDE (E. O. C.). **Observations on the germination and seedling establishment of Peas.**—*N.Z. J. Sci. Tech.*, A, xxi, 1, pp. 61–70, 4 figs., 1939.

Clean, moist sand has been found to be the most satisfactory medium for laboratory germination tests on peas, which in unsterilized soil are very subject to pre-emergence damping-off, mostly caused by soil-borne pathogens, such as *Fusarium* and *Pythium* spp. [*R.A.M.*, xvii, p. 286]. The disease is much more prevalent in 'wet' than in 'dry' soils (30 and 20 per cent., respectively, of the dry weight, the maximum water-holding capacity of the soil being estimated at 40 per cent.), the rate of seedling establishment ranging from 0 (Greenfeast 3) to 78 (Pioneer) per cent. in the former and from 55 to 96 for the same two varieties in the latter. Ceresan and agrosan have given satisfactory results in the reduction of damping-off, the optimum dust loads being 3 and 4 oz. per bush., respectively. The dusts are injurious to the seed only when applied in great excess under dry soil conditions. They neither produced adverse effects nor lost their efficacy during storage, the emergence rates of seed of Pioneer, William Massey, and Greenfeast dusted 15 months earlier being 73, 89, and 85 per cent. compared with 48, 39, and 26, respectively, for the untreated controls.

Agricultural research in Idaho. No. 1 of a series. Beans that resist mosaic and curly top.—*News Lett., Idaho*, xxii, 3, p. 1, 1939. [Abs. in *Plant Breed. Abstr.*, ix, 4, p. 478, 1939.]

Successful results are stated to have been secured in Idaho in the breeding of beans [*Phaseolus vulgaris*] showing combined resistance to mosaic and curly top [*R.A.M.*, xviii, pp. 296, 430]. Resistant strains of Red Mexican beans have been introduced under the names Red Mexican U.I. Nos. 3 and 34 and similar strains of the Great Northern, Red Kidney, Pinto, and other field varieties have been selected from hybrid populations and are undergoing further testing prior to release.

JENKINS (W. A.). **A new disease of Snap Beans.**—*Science*, N.S., xc, 2325, p. 63, 1939.

In June, 1938, the author observed in Georgia a new and very

destructive disease of snap beans [*Phaseolus vulgaris*], which reappeared in an even worse form in 1939. The chief symptom consisted in a deep brown to black discoloration of the inner phloem and outer xylem of the whole plant. The condition led to severe chlorosis, followed by wilting and death. Severely infected roots were dark grey to black on the outside. Brown to brownish-purple, longitudinal stripes of various widths were present on the upper hypocotyl and stem. Affected pods showed a purplish-brown discoloration of one or both sutures. Cross sections of diseased pods revealed that a few to all of the vascular bundles were discoloured, while the chlorenchymatous pulp of heavily infected young pods was frequently of an inky appearance. The greatest loss was incurred about blossoming time, only a few lightly infected plants surviving. No causal organism could be isolated, and the condition would appear to be due to a virus with a long incubation period, since plants raised from seed from infected pods remain healthy until blossoming time.

WEBER (G. F.). **Web-blight, a disease of Beans caused by Corticium microsclerotia.**—*Phytopathology*, xxix, 7, pp. 559–574, 7 figs., 1939.

A detailed account is given of investigations carried out in Florida into a disease, termed web blight, of Lima beans (*Phaseolus lunatus*), previously recorded as due to *Rhizoctonia microsclerotia* [*R.A.M.*, xiv, p. 416]. From 1935 to 1937, inclusive, infection caused an estimated loss of 66 per cent. at La Crosse, while in 1935 at Florahome it was responsible for a total loss in a 15-acre field of snap beans [*P. vulgaris*], and in 1936 produced over 50 per cent. loss in a 60-acre field of this crop in the same locality. The fungus has been observed to be parasitic on a large number of perennials and annuals.

The pathogen produces two types of mycelium, superficial and subepidermal. The former is about twice the diameter of the latter and spreads out fanwise over the leaf blade. The relatively small, superficial sclerotia, 80 to 300 by 80 to 600 (average 200 by 350) μ, are characteristic of the fungus and constitute the means by which it is usually disseminated. Wedge- to oval-shaped basidia are produced on hyphae attached to the surface of the host, each with four sterigmata bearing hyaline, non-septate, oval, slightly irregular basidiospores, 5 to 6 by 9 to 11 μ. As the fungus is distinct from related species and has not before been recognized by a basidiospore stage, the binomial *Corticium microsclerotia* (Matz) n. comb. [n.sp.] (syn. *R. microsclerotia*) is proposed for it, the original description being amended.

The fungus grows readily in complete darkness, or continuous, intermittent, or subdued light, and covers the surface of a Petri dish in 24 to 36 hours at 80° to 85° F. on most media. The sclerotia, scattered directly from the host on the surface of potato agar plates, gave 100 per cent. germination in 12 hours. Artificial inoculations by sprinkling sclerotia over the leaf blades of wet plants kept in a moist chamber for 24 hours and then placed in a greenhouse gave positive results in three days on tomato, beet, carrot, eggplant, cucumber, cantaloupe, watermelon, and snap and Lima beans, but lettuce remained unaffected.

The disease has always been observed in Florida during the summer rainy period, when the daily maximum and minimum temperatures

are about 90° and 70°, respectively. It frequently destroys the late spring crop in June when the summer rains begin early, and the early autumn crop in November, when the rainy season is prolonged. The fungus survives from one season to the next on plant debris in cultivated fields, along fence rows and ditches, and on living plants. The sclerotia are disseminated by natural agencies, such as wind, rain, running water, and heavy dews, mechanical means during cultivation, animals, and human beings. In laboratory tests it remained viable for ten months in culture dishes at room temperature.

Control measures suggested comprise crop rotation and the non-cultivation of beans from 1st June until 1st September in fields where previous bean crops have been infected.

Kreutzer (W. A.). **Host-parasite relationships in pink root of Allium cepa L. I. The pigment of Phoma terrestris.**—*Phytopathology*, xxix, 7, pp. 629–632, 1939.

In some Colorado soils onion roots infected by *Phoma terrestris* [*R.A.M.*, xvii, pp. 302, 831] showed a yellow to yellowish-brown discoloration instead of the pink colour generally associated with the disease. Cultural studies [which are described] showed that this variation was not associated with temperature or nutritional factors, but was reproduced by changes in the P_H value of the medium. In preliminary tests, using diseased pink roots and agar mats on which *P. terrestris* was growing, the colour changed from red or reddish-purple at P_H 8·5 to yellow or yellowish-brown at 4·5. When the pigment was extracted from the hyphae and used in solution the change took place within the range P_H 7·00 to 7·86. The pigment could be precipitated from an alkaline solution by the addition of saturated sodium sulphate and redissolved in a 2 per cent. solution of emulsin. As the material appears to be slightly hydrolysed by the enzyme emulsin at least part of the molecule would seem to be of the nature of a β-glucoside.

Wiant (J. S.), Ivanoff (S. S.), & Stevenson (J. A.). **White rust of Spinach.**—*Phytopathology*, xxix, 7, pp. 616–623, 2 figs., 1939.

This is an expanded account of a paper already noticed [*R.A.M.*, xviii, p. 367].

Iwata (Y.). **Pseudoperonospora cubensis (Berk. et Curt.) Rostow. on Trichosanthes japonica.**—*Ann. phytopath. Soc. Japan*, viii, 4, pp. 336–338, 2 figs., 1939. [Japanese. Abs. in *Biol. Abstr.*, xiii, 7, p. 1206, 1939.]

Pseudoperonospora cubensis is recorded for the first time on *Trichosanthes japonica*, and notes are given on the symptoms produced on the new host, the morphology of the fungus, and the positive results secured in cross-inoculations between *T. japonica*, cucumbers, and other Cucurbitaceae.

Wood (F. C.). **Studies on 'damping off' of cultivated Mushrooms and its association with Fusarium species. II.**—*Phytopathology*, xxix, 8, pp. 728–739, 3 figs., 1 graph, 1939.

Continuing his studies at Trinity College, Cambridge, on the relation

of *Fusarium* spp. to damping-off of cultivated mushrooms (*Agaricus campestris*) [*Psalliota* spp.] in England [*R.A.M.*, xvi, p. 434], the writer ascertained, by experiments with the patented spawn jar of the Chester County (Pennsylvania) Mushroom Laboratories, that a mutual antagonism exists between the brown mushroom strain used in the tests and *F. culmorum*, *F.* [*solani* var.] *martii*, *F. oxysporum*, *F. flocciferum*, and *F. dianthi* in the inoculated maize meal-sand casing soil. Once the casing soil becomes permeated by these organisms the growth of the mushroom mycelium is suppressed. At the junction of the spawn and the casing soil a deep brownish layer was formed, below which the normally bluish-white spawn assumes a reddish tinge. The growth rates *F. oxysporum* and *F. solani* var. *martii* to *P.* spp., were represented by rates of 3:1 and 4:1 respectively, and other species of *Fusarium* gave similar results. When a malt agar plate was inoculated with *Fusarium* and *Psalliota* on opposite sides little or no antagonism could be perceived, but when the mushroom was allowed to grow to a colony of 2 cm. in diameter before inoculation with the *Fusarium* antagonism was pronounced. In the case of *F. culmorum* the area of antagonism was outlined by the deposition of a brilliant scarlet pigment, growth ceasing at a distance of 2 mm. from the mushroom.

In experiments with *F. culmorum* the presence in the casing soil of toxins from filtrates of cultures on Richard's solution caused the same symptoms and similar yield reductions as the living fungus, but the toxins had a stimulatory rather than inhibitory effect when their incorporation was delayed until the beginning of spawn growth.

The thermal death points on Dox's agar of *F. solani* var. *martii* and *F. oxysporum*, the two species most commonly associated with damping-off, were found to be 47° to 48° and 55° C., respectively, for a 20-minute exposure, the corresponding temperature for five minutes being 50° to 51° and 58° to 59°. Similar tests with the other species concerned indicated that the casing soil may be freed from fungal contamination by 20 to 30 minutes' exposure to steam heat at a temperature of 60° to 70°.

Branas (J.). **Chronique. Évolution du mildiou dans la vignoble méridional en 1939.** [Current notes. Development of mildew in southern vineyards in 1939.]—*Progr. agric. vitic.*, cxii, 30, pp. 53, 57, 1939.

A detailed account is given of observations on the development of vine mildew [*Plasmopara viticola*] made during 1939 in the south of France. Temperature did not appear to be an important factor locally in determining the duration of the incubation period, the chief influence being the water content of the tissues. Aramon vines bound up tightly from 6th June, and therefore containing more water than others not so treated, showed lesions three times as large as those on adjacent vines not so tied. At the end of the season, yellowing leaves containing much water were attacked, while drier leaves were unaffected. Varieties with highly turgescent organs were more affected than others. Some relation probably exists between severity of attack, size of lesions, duration of incubation, and the degree of turgescence of the tissues.

OSTERWALDER (A.). **Prüfung von Peronospora-Bekämpfungsmitteln im Sommer 1938.** [The testing of preparations for *Peronospora* control in the summer of 1938.]—*Schweiz. Z. Obst- u. Weinb.*, xlviii, 14, pp. 244–249, 1939.

Of the preparations tested at Wädenswil, Switzerland, in 1938 for the control of vine *Peronospora* [*Plasmopara viticola*], 1 per cent. cuprenox [*R.A.M.*, xvi, p. 773], a bluish-green paste containing copper oxychloride and manufactured by Agricola S.A. Bussigny (Vaud), gave the most satisfactory results. Six applications between 3rd June and 3rd August effectively combated the disease on Räuschling.

Plantesygdomme i Danmark 1938. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1938. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, xliv, 1, pp. 1–53, 5 figs., 2 graphs, 1939.

This report, prepared on the usual lines [*R.A.M.*, xvii, p. 87], contains among other items of interest the following information presented by E. Gram, H. R. Hansen, Gudrun Johansen, and Anna Weber. Boron deficiency of beets, though not widely prevalent, was troublesome locally, reducing the dry weight of Tystofte VII sugar beets in south Jutland, for instance, from 20·7 to 17·8 per cent.

Potato leaf roll and mosaic were observed throughout the country [ibid., xvii, p. 338], the latter being specially prevalent. At Tylstrup the Karma, Preussen, Edeltraut, and Aal varieties suffered severely from mosaic, while Juli, Kaiserkrone, Gustaf Adolf, and Tylstrup Odin were only slightly affected. Systematic counts of the incidence of mosaic and leaf roll in 114 fields in the Copenhagen district yielded the following comparative varietal data: King Edward 25 and 0 per cent., respectively, Bintje 31 and 0, Juli 28 and 12, Svaløf Birgitta 47 and 6, Sydens Drønning [Southern Queen] 8 and 5, and Magnum Bonum 37 and 2. Wart disease (*Synchytrium endobioticum*) was observed in four new administrative areas. *Cercospora concors* [ibid., xvii, p. 60] was found on the Up-to-Date, Deodara, and Goldperle potato varieties.

Repeated applications of Bordeaux mixture to bare asparagus stems, before the first signs of new growth, proved effective against rust (*Puccinia asparagi*) [ibid., xviii, p. 649].

The infection of wheat by *Ophiobolus graminis* [ibid., xviii, p. 386] was promoted by the practice of ploughing-under twice instead of once.

Relatively little attention is paid to the disinfection of rye seed-grain (only 13 per cent. of the fields in the Roskilde district treated as against 95 per cent. of wheat), and some severe attacks of flag smut (*Urocystis occulta*) were reported in consequence.

Grey speck of oats, associated with manganese deficiency [ibid., xviii, p. 668], occurred in a devastating form in certain areas and also affected winter wheat on clay soil in the Horsens district. In one locality the beneficial effects of fertilizing with manganese sulphate (75 or 150 kg. per hect.) in experimental plots laid down in 1935 are still persisting, appreciable increases in the mangold, barley, and clover crops having been obtained in 1936, 1937, and 1938, respectively.

Zantedeschia [*aethiopica*] plants from a Jutland nursery-garden showing typical mosaic symptoms [ibid., xiv, p. 587] recovered almost completely after a year in the greenhouse.

WOOD (JESSIE I.) & NANCE (NELLIE W.). **Diseases of plants in the United States in 1937.**—*Plant Dis. Reptr, Suppl.* 110, 319 pp., 12 graphs, 23 maps, 1939. [Mimeographed.]

This report [cf. *R.A.M.*, xvii, p. 589] contains valuable information on the incidence and distribution of, and losses caused by, diseases affecting the cereal, fodder, vegetable, fruit, sugar-cane, and miscellaneous crops in the United States in 1937.

Fifty-first Annual Report of Purdue University Agricultural Experiment Station, Lafayette, Indiana, for the year ending June 30, 1938.—117 pp., 34 figs., 1 graph, [? 1939].

The following are among the items of phytopathological interest occurring in this report [cf. *R.A.M.*, xv, p. 633]. Analyses by H. R. Kraybill and D. M. Doty of wheat samples severely infected by black stem rust [*Puccinia graminis*] generally revealed abnormally high percentages of protein, ash, and fibre and a low starch content as compared with relatively sound material.

Ascospores of the apple scab fungus [*Venturia inaequalis*] are reported by R. C. Baines to have been liberated on 3rd March, 1938, the earliest date yet recorded for Indiana, and by the petal-fall stage some 90 per cent. had been discharged in the southern part of the State.

In R. W. Samson's experiments to determine the part played by tomato seed in the transmission of *Macrosporium* [*Alternaria*] *solani* [ibid., xviii, p. 785], 700 seeds were extracted from rotted fruits, sterilized, and plated out on agar, where only two gave rise to typical colonies of the fungus. In another test involving 7,700 seeds from a canning factory, again only two carried the pathogen internally, and this source of infection in commercial seed is not likely, therefore, to be of any significance. The same worker, with L. C. Shenberger, found that an effective seed treatment for tomato was five to ten minutes' immersion of the seed in 1 in 24,000 or 1 in 32,000 ethyl mercury phosphate; no appreciable deterioration was observed after 18 months' storage. Where damping-off [*Pythium*, *Phytophthora*, and *Rhizoctonia* spp.: ibid., xviii, p. 421 *et passim*] occurred the treated seed gave better results than untreated. Encouraging progress has been made by E. C. Stair in the development of Indiana Baltimore tomatoes resistant to wilt (*Fusarium*) [*bulbigenum* var. *lycopersici*: ibid., xviii, p. 788], one 1936 selection remaining entirely healthy in 1937 in a field where the susceptible varieties were destroyed.

Coleosporium crowellii [ibid., xviii, p. 2] has been determined as the agent of a new disease of limber and piñon pines [*Pinus flexilis* and *P. edulis*] in New Mexico. The rust is of unusual morphology, producing long teleutospore chains on the needles, closely simulating the aecidia of other needle rusts.

None of the China asters [*Callistephus chinensis*] (over 400) tested by E. R. Honeywell during the last ten years has shown any evidence

of permanent immunity from wilt (*F.*) [*conglutinans* var. *callistephi*: ibid., xvii, p. 247].

Using Wildman's technique [ibid., xvi, p. 536], the incidence of mould mycelia in sour cream butter was found to be influenced by seasonal conditions, the percentage of samples having less than 20 positive fields rising from 9·7 in September to 98 in February.

FAWCETT (G. L.). **Departamento de Botánica y Fitopatología.** *Ex* **Memoria anual del año 1938.** [Department of Botany and Pathology. *Ex* Annual Report for the year 1938.]—*Rev. industr. agríc. Tucumán*, xxix, 1–3, pp. 36–39, 1939.

This report [cf. *R.A.M.*, xviii, p. 237] contains the following items of phytopathological interest in addition to information already presented from another source. Sugar-cane in Tucumán suffered from two types of red rot during the period under review, one caused by *Cephalosporium sacchari* [ibid., xviii, p. 625], a secondary pathogen following infestation by *Diatraea saccharalis*, and the other due to *Colletotrichum falcatum*.

Pomelo and lemon fruits developed a chestnut-coloured spotting associated with a species of *Septoria*, probably *S. citri* [ibid., xviii, p. 671], the lemons being shed before maturity. Inoculation experiments gave positive results only on green fruits in a very damp atmosphere at 25° to 30°.

Promising results in the control of 'corcova' [hunchback] of tobacco [ibid., xviii, p. 202] were obtained by spraying the foliage with lead arsenate, which repels the insect vector [*Frankiniella paucispinosa*] of the disease.

Leaf curl of tomato appears to be caused by the identical virus responsible for the same disease in beets [ibid., xviii, p. 237], and is likewise transmissible by *Agallia* [*Aceratagallia*] *sticticollis*. The North American curly top of beets, on the other hand, is evidently a distinct disease, judging from experiments carried out by the Washington Department of Agriculture with Argentine material, in which the United States vector [*Eutettix tenellus*] failed to convey the virus from infected to healthy plants.

CASTELLANI (E.). **Considerazioni fitopatologiche sull' Africa Orientale Italiana.** [Phytopathological notes on Italian East Africa.]—*Agricoltura colon.*, xxxiii, 8, pp. 486–492, 5 figs., 1939.

The author states that in some of the less arid regions of Italian East Africa he observed *Sclerospora sorghi* [*R.A.M.*, xiv, p. 80] on maize and *Pennisetum typhoideum*, *Phytophthora palmivora* on coconut palm, *Bacterium malvacearum* on cotton, *Bact. solanacearum* on castor [*Ricinus communis*] and groundnut, and *Phytophthora colocasiae* on a member of the Araceae.

GEIGER (W. B.) & ANDERSON (R. J.). **The chemistry of Phytomonas tumefaciens. I. The lipids of Phytomonas tumefaciens. The composition of the phosphatide.**—*J. biol. Chem.*, cxxix, 2, pp. 519–529, 1939.

An examination was made of the lipids of *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xvii, p. 798] on two synthetic media, one con-

taining glycerol and the other sucrose, at the Sharp and Dohme Biological Laboratories, Glenolden, Pennsylvania. On the former the bacteria yielded only 2 per cent. total lipids, of which about 44 per cent. was phosphatide, the corresponding figures for the latter being 6 and 64 respectively. The phosphatides consisted of about equal parts of lecithin and cephalin. Differences [which are described] were also detected between the fatty acids of the phosphatides from bacteria grown on the two media.

STAPP (C.). **Bakterielle Pflanzenerkrankungen.** [Bacterial plant diseases.]—*Zbl. Bakt.*, Abt. 1 (Orig.), cxliv, 1–5, pp. 94–108, 16 figs., 1939.

A summary is given of the available knowledge concerning a number of well-known bacterial diseases of plants, references to all of which have repeatedly appeared in this *Review*.

DILLON WESTON (W. A. R.). **Modern methods of seed disinfection.**—*Ann. appl. Biol.*, xxvi, 3, pp. 636–640, 1939.

In this paper the author discusses modern methods of seed treatment against cereal diseases, distinguishes between seed disinfectants and seed protectives, and disposes of the criticisms sometimes levelled against the organo-mercury dusts on the grounds of expense and the danger to the workers involved in their use. [Much of this information appears in a more popular form in *J. Minist. Agric.*, xlvi, 6, pp. 593–601, 1939.]

Report of the Sixth Hard Spring Wheat Conference, 1939.—71 pp., Northwest Crop Improvement Association, Minneapolis, Minnesota, 1939. [Mimeographed.]

Speaking at the Sixth Hard Spring Wheat Conference held at Minneapolis in February, 1939, R. W. Smith presented evidence that wheat varieties badly attacked by stem rust [*Puccinia graminis*: *R.A.M.*, xviii, p. 660] were more severely injured by grasshoppers than those slightly rusted.

E. W. Hanson shows in tabular form the resistance or susceptibility of the spring wheat varieties studied at St. Paul, Minnesota, to nine major diseases. The most difficult wheat disease problems in Minnesota are scab [*Gibberella saubinetii*: ibid., xviii, p. 661] and root rot (chiefly *Helminthosporium sativum* and *Fusarium* spp.) [ibid., xviii, p. 515], to which none of the commercially grown or new varieties shows any appreciable resistance. Scab causes very serious losses in the southern part of the State whenever favoured by weather conditions, and losses from root rot are incurred every year, amounting, not uncommonly, to 30 to 50 per cent. in some fields. High temperatures favour infection, and early planting is therefore recommended. Deep planting favours seedling blight [*G. saubinetii*]. More blight tended to develop in the poorer samples, in which both stand and vigour were inferior, than in the better lots of bread and durum wheats. Seed treatment greatly reduced blight and the percentage of dwarfed plants. Treatment of the poorer lots gave greater benefits than treatment of the better lots. Crop rotations including wheat for two or more years in succession

had more blight than any other rotations. Least blight resulted in those sequences where wheat followed potatoes or a leguminous crop.

M. N. Levine stated that the 1938 epidemic of leaf [brown] rust [*P. triticina*] in the United States was the worst on record [ibid., xviii, p. 663]. Marquis now appears to be entirely susceptible, probably because of the predominance of races 9 and 15 in the last few years, and their great virulence on most early hard red spring wheats.

E. C. Stakman stated that race 56 of *P. graminis* [ibid., xviii, p. 94], first found in 1928, has increased steadily, until in 1938 over 60 per cent. of all the stem rust isolates from wheat in the United States belonged to this race, or 83 per cent. of the collections. Race 56 averaged 72 per cent. of all collections in the spring wheat States. Race 34 has decreased since 1934. Race 56 was not found in southern Mexico, where almost all the rust belonged to races 38 and 59. Nine races, including 56, were found in northern Mexico. Race 56 is very virulent on Ceres, and has apparently been responsible for the downfall of this variety. Of the rust collections made in 1938, 94 per cent. were not virulent on Thatcher. Other races found in the spring wheat area in 1938 were 38, 19, and 17, of which the first two were virulent on durum wheats. Races attacking Vernal emmer included 15, 69, 97, and 53.

Kale (G. T.). **Breeding rust resistant Wheat.**—*Int. Rev. Agric.*, xxix, 10, pp. 371T–381T, 1938; xxx, 9, pp. 325T–330T, 1939.

For each of the European countries, the United States, Canada, Russia, South Africa, Australia, and India, notes are given on the damage caused in recent years by wheat rusts (*Puccinia graminis tritici*, *P. glumarum*, and *P. triticina*), together with accounts of the relative prevalence of the different species and their physiological races in the same countries, and the defensive measures adopted against these diseases. The paper concludes with a short discussion on breeding for rust resistance. A bibliography of 103 titles is appended.

Tennent (R. B.). **Mercurial dusting of seed Wheat. Effect on germination.**—*N.Z. J. Agric.*, lix, 2, pp. 133–134, 1939.

The author adduces evidence showing that when wheat seeds treated against stinking smut [*Tilletia caries* and *T. foetens*: *R.A.M.*, xviii, p. 94] with mercury dusts (e.g., agrosan and ceresan) are sprouted on paper such treatment may reduce germination, though the reduction is practically negligible in the case of thoroughly conditioned seed; when, however, germination is measured by the results obtained from sowing seed in the soil, no depression occurs, treatment, in fact, being likely to increase germination. Dusted seed stored for four months showed no reduction in germination, as compared with untreated seed similarly stored.

Sadavisan (T. S.). **Succession of fungi decomposing Wheat straw in different soils, with special reference to Fusarium culmorum.**—*Ann. appl. Biol.*, xxvi, 3, pp. 497–508, 2 graphs, 1939.

In investigations carried out at Rothamsted the author studied the succession of fungi developing on buried wheat straw in four arable

soils, an allotment soil, and a glasshouse compost, both natural, untreated straw and straw autoclaved in a 2 per cent. solution of sodium nitrate being used. The dominant colonizers found were *Fusarium culmorum*, *Mucor* spp., and *Penicillium* spp., and detailed records were made of these only, though fungi belonging to eleven other genera were also found. In two experiments [which are described], *F. culmorum* and *Mucor* spp. were dominant in the earlier stages of straw colonization but gave way to *Penicillium* spp. in the later stages. The nitrogenous treatment of the straws encouraged the development of *Penicillium* spp. at the expense of *F. culmorum* and *Mucor* spp.

The pathogenicity of the *F. culmorum* isolates to wheat seedlings was established by inoculation tests. The data obtained show that *F. culmorum* should be included in Reinking and Manns's group of soil-inhabiting species of *Fusarium* [*R.A.M.*, xiii, p. 128] or true soil fungi.

Olsen (C.). **The employment for water culture experiments of distilled water containing traces of copper.**—*C.R. Lab. Carlsberg*, Sér. chim., xxiii, 5, pp. 37–44, 1939.

In connexion with a series of experiments at the Carlsberg Laboratory, Copenhagen, it is mentioned that barley grown in culture solutions containing traces of copper (0·6 mg. per l.) was not attacked by mildew [*Erysiphe graminis*], which developed, on the other hand, on the control plants in ordinary distilled water solutions. All the plants throve better in the copper-containing solutions; they were found to contain about twice as much of the element as those in the control series.

Murphy (H. C.). **Effect of crown and stem rusts on the relative cold resistance of varieties and selections of Oats.**—*Phytopathology*, xxix, 9, pp. 763–782, 4 figs., 1939.

The outstanding results of the writer's experiments in Iowa on the effect of crown and stem rusts (*Puccinia coronata* and *P. graminis*) on the relative cold resistance of varieties and selections of oats have already been noticed [*R.A.M.*, xv, p. 486], and are here expanded and tabulated. Plants in the four-leaf stage, whether infected or healthy, were less resistant to cold than equally hardened ones with six leaves. The hardiness index of plants of 21 varieties with 20 to 80 per cent. crown rust was 13 to 68 per cent. lower than that of healthy ones under similar conditions, the corresponding reduction for 15 to 85 per cent. stem rust being 9 to 91 per cent. Of 21 oat varieties tested, the hardiest, on the basis of tests with rust-infected, shaded, and control plants, were Hairy Culberson, Culberson, Culred, Coker 32–1, Fulghum (winter types, C.I. 2498 and 2499), Bicknell, Winter Turf (C.I. 3295 and 3296), and Sporen.

Hadden (S. J.). **A method of inducing an epiphytotic of rust in grain breeding nurseries.**—*J. Amer. Soc. Agron.*, xxxi, 8, pp. 728–729, 1 fig., 1939.

Earlier, more severe, and more uniform outbreaks of crown rust of oats [*Puccinia coronata*] have been induced during the past three years at the Georgia Agricultural Experiment Station by planting all alley-

ways and borders with a susceptible variety, such as Winter Turf. Plants of the same variety heavily inoculated in the greenhouse during the late winter are set at intervals throughout the borders in early spring. A wooden frame carrying cotton sheeting is placed over the rusted and adjacent plants and for several consecutive evenings the ground and covering thoroughly wetted. As soon as infection is well established the frame may be moved to another centre. Infection thus induced usually spreads rapidly from these initial foci throughout the susceptible border variety.

VOLKART (A.). **Der Roggensteinbrand (Tilletia secalis [Corda] Kcke.).** [Rye bunt (*Tilletia secalis* [Corda] Kcke.).]—*Ber. schweiz. bot. Ges.*, xlix, pp. 495–503, 1939.

In July, 1930, the writer detected the presence of *Urocystis occulta*, not hitherto recorded in Switzerland, on a single rye plant in Leventina, Ticino, and at the same time *Tilletia secalis* [*R.A.M.*, xii, pp. 549, 616] was observed on others in the same locality and elsewhere in the canton. Previous records of rye bunt in the country are regarded as doubtful.

T. secalis is capricious in its development. In the restricted area involved in the Ticino, for instance, it was prevalent in 1930, much rarer in 1931 (under 3 per cent.), absent in 1932, and again abundant in 1934. The spore diameter of *T. secalis* exceeds that of *T. tritici* [*T. caries*], the average figures of seven collections (including three herbarium specimens from Czechoslovakia, U.S.S.R., and Germany) of *T. secalis* varying from $21{\cdot}63 \pm 0{\cdot}08$ to $24{\cdot}35 \pm 0{\cdot}10\mu$; and of ten of *T. caries* (six on wheat and four on spelt, all from Switzerland), from $19{\cdot}14 \pm 0{\cdot}11$ to $20{\cdot}53 \pm 0{\cdot}12\mu$. Unlike *T. caries*, *T. secalis* cannot be induced to germinate under ordinary laboratory conditions, none of the writer's very numerous experiments having been certainly successful, though on one occasion sporidium-like structures, 44 to 110 by 4 to 5 (average 79·4 by 4·45)μ, with up to six septa, were formed on acid loam after 23 days. Similar behaviour is characteristic of *T. guyotiana* Har., another new record for Switzerland, collected on *Bromus mollis*.

In cross-inoculation experiments with *T. secalis* and *T. caries* the former in one series caused 0·6 per cent. infection of Rothenbrunner rye but gave entirely negative results on wheat in all the tests; conversely, *T. caries* failed to attack rye while profusely infecting its own host. Though *T. secalis* may possibly be able to pass from rye to wheat under other conditions, it is clear from the information here presented that the two species of bunt are totally distinct.

KOEHLER (B.). **Crazy top of Corn.**—*Phytopathology*, xxix, 9, pp. 817–820, 1 fig., 1939.

'Crazy top' is the name applied to a remarkable abnormality of maize causing heavy losses in certain localized areas of Illinois, the affected plants tending to occur in groups in more or less depressed areas in fields on moderately to highly fertile soils in both the north and south of the State. Floral organs are partially or entirely absent and are replaced by vegetative shoots. In some instances of tassel derangement the ear shoots bear grain, and among the leafy prolifera-

tions of the tassel are a few branches with apparently normal male florets. In one field of hybrids nearly half the plants showed excessive jointing of the upper half of the stalk instead of bunching of the tops; in this form of the disorder leafy branches were produced instead of ears. Comparable malformations were noted in *Echinochloa crus-galli* and *Setaria viridis* in one of the severely diseased maize areas. The etiology of the disturbance is obscure.

GOIDÀNICH (G.). **Ricerche sul deperimento del Sorgo zuccherino verificatosi in Italia nella primavera del 1938.** [Researches on the wilt of saccharine Sorghum observed in Italy in the spring of 1938.]—*Boll. Staz. Pat. veg. Roma*, N.S., xix, 1, pp. 1–74, 4 pl. (2 col.), 29 figs., 1939.

A detailed account is given of investigations carried out on a wilt of saccharine sorghum causing heavy losses in Italy in 1938 and found to be due to unfavourable environmental conditions predisposing the plants to attack by red stripe disease [*R.A.M.*, xviii, p. 518] and red leaf spot [loc. cit.], of which the latter appeared to be caused by insect infestation.

KENDRICK (J. B.) & BRIGGS (F. N.). **Pythium root rot of Milo and the development of resistant varieties.**—*Bull. Calif. agric. Exp. Sta.* 629, 18 pp., 7 figs., 1939.

An account is given of the sorghum root rot caused by *Pythium arrhenomanes* [*R.A.M.*, xvi, p. 807; xviii, p. 517], which has been recognized in the upper delta region of the Sacramento River, California, since 1935, and of the greenhouse and field trials carried out with a view to the development of resistant varieties. Double Dwarf Darlo is highly resistant as well as productive, comparing favourably in these respects with Double Dwarf Yellow milo, but it has the drawbacks of maturing a fortnight later in some localities and of being relatively intolerant of alkali and heat. Promising results have been obtained in the selection of almost 100 per cent. resistant strains of Double Dwarf Yellow, Dwarf White, and Heileman from heavily infected commercial plantings, and arrangements are being made for their increase and distribution through an approved State agency.

EL-HELALY (A. F.). **Studies on the control of kernel smut of Sorghum.**—*Bull. Minist. Agric. Egypt* 233, 22 pp., 3 figs., 1939.

In experiments carried out at Dokki, Egypt, during 1935–6, early sown plants of sorghum were more severely attacked by kernel smut (*Sphacelotheca sorghi*) [*R.A.M.*, xviii, p. 588] than later sown ones, temperature being apparently the decisive factor. Infection only occurred from 15° to 35° C. since within these limits both the grain and the spores are capable of germination. In early sowings the full range of these temperatures obtains and consequently severe attacks can take place, whereas with the gradual rise in temperature the range becomes so limited that the disease is very reduced in later sowings. Throughout these experiments, with only one exception, the 'afir' method of sowing [ibid., xviii, p. 171] gave a considerably smaller percentage of diseased plants than the 'herati'. This is tentatively

attributed to the more favourable soil temperatures and humidity in the 'herati', or to the fact that watering, which follows sowing in the 'afir' method, may remove the spores adhering to the seed coat.

In seed disinfection tests in the laboratory the toxicity of sulphur and copper carbonate was increased enormously by using soil filtrate instead of distilled water. In field trials complete control without any adverse effect on seed germination and growth was obtained either by mixing the seed with agrosan G (2·5 or 5 gm. per kg.) or treating it with uspulun or germisan (1 or 2 per cent. solution for 15 mins.). Sulphur (5 to 10 gm. per kg.) gave partial control, while the cheapest and most effective results were achieved with clean seed. The cost of treatment with any of the recommended fungicides, however, is stated to be practically negligible.

RUDOLPH (B. A.) & HARRISON (G. H.). **Attempts to control Verticillium wilt of Cotton and breeding for resistance.**—Abs. in *Phytopathology*, xxix, 8, pp. 753, 1939.

The heavy soils of the San Joaquin Valley, California, where cotton has been grown continuously for the last ten years, have become extensively (and in places totally) permeated by *Verticillium albo-atrum* [*R.A.M.*, xvii, p. 504], the selection of strains resistant to which has been successfully accomplished within the varieties Cooke 307–6, Mexican Big Boll, Kekchi, Tuxtla, and Missdel. Strains of Stoneville and Acala, while not resistant, are prolific under heavy infection. The American-Egyptian types are highly resistant to *V. albo-atrum*, and an attempt is in progress to transfer the resistance of Pima to Acala by means of back-crossing.

EZEKIEL (W. N.). **Girdling of Cotton plants as affecting survival of Phymatotrichum omnivorum.**—Abs. in *Phytopathology*, xxix, 8, p. 753, 1939.

In preliminary experiments [in Texas] suggested by the work of R. Leach on *Armillaria mellea* [*R.A.M.*, xvi, p. 564], cotton plants girdled on 29th July, 1938, developed bronzing of the foliage within 11 days and a third of the total were dead in less than a month. The necrotic process coincided with a rapid decrease of alcohol-soluble solids and total sugars in the roots. *Phymatotrichum omnivorum* was not recovered in a viable form from the roots of girdled plants after three, five, or eight weeks, whereas the fungus readily developed from those of the untreated controls. In another test started on 3rd September, girdling failed to produce any change in the aerial organs of cotton plants or to impair the viability of *P. omnivorum* on the roots, the effects of girdling being apparently associated exclusively with the period of rapid growth of the host.

KING (C. J.) & BARKER (H. D.). **An internal collar rot on Cotton.**—Abs. in *Phytopathology*, xxix, 8, p. 751, 1939.

A fungus characterized by dark brown, multiseptate chlamydospores and endogenous cylindrical spores, and apparently identical in all morphological characters with *Thielaviopsis basicola*, is the agent of a hitherto unreported root rot of cotton, manifested by a purplish-black discoloration of the infected tissues, which has been observed

in the Sacaton district of Arizona for several years. The disease causes heavy mortality among seedlings when the soil is cold and wet, and a relatively quiescent period during the hot weather is followed by renewed activity in the late summer. Inoculation experiments with *T. basicola* resulted in the typical symptoms of the rot (except for the death of mature plants), the fungus being recovered in culture. American-Egyptian varieties are more susceptible than upland. *T. basicola* persists in the soil for years, but its rate of spread is slow.

Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August, 1938.—160 pp., 1939.

In a note on the Punjab root rot scheme [*R.A.M.*, xiii, p. 697] it is stated that infection by *Rhizoctonia bataticola* [*Macrophomina phaseoli*] and *R.* [*Corticium*] *solani* [ibid., xviii, p. 674] starts on the cotton crops of both native and American varieties at an age of six to eight weeks (end of June). The 83 *A.F.* variety was comparatively resistant in 1938, when the incidence of disease was abnormally high.

Of 88 strains tested at the Parbhani (Hyderabad) Cotton Research Station, 26 showed a fair degree of field resistance to wilt (*Fusarium vasinfectum*) [ibid., xvi, pp. 97, 589]. Six out of 11 strains tested at Latur also proved fairly resistant. There is a great demand for the wilt-resistant *Gossypium neglectum verum* 434, a selection from 262, which is hardy, prolific, and excellent for spinning.

Ciferri (R.) & Redaelli (P.). **Mycotorula vs. Candida: a plea.**—*Mycopathologia*, ii, 2, pp. 73–74, 1939.

After briefly discussing the recent paper by Diddens and Lodder on generic taxonomy in the Mycotoruloideae [*R.A.M.*, xviii, p. 525], the authors state that the reaggregation of asporogenous yeasts with pseudomycelium into two genera, one with blasto-arthrospores (= *Trichosporon*) appears to be useful, but consider that workers' views on the nomenclature of the former group may be difficult to reconcile. Rejecting *Monilia* and *Syringospora* [ibid., xv, p. 581] as names for this group, they adduce their reasons for preferring the generic name *Mycotorula* to *Candida*. These are as follows. *Mycotorula* Will (1916) enjoys priority over *Candida* Berkhout (1923), and this they regard as fundamental. In the second place, the original generic description of *Mycotorula* is better than that of *Candida*. Thirdly, the type species of *Mycotorula* is original, while *Candida* is based on a 'conventional' restoration of an old, not easily recognizable species, *Monilia candida* Bonorden. Further, *Mycotorula* has been used mainly in its original sense, whereas *Candida* has been very extensively used in many divergent senses by different workers. Finally, if *Candida* were adopted, the use of the subfamily name Mycotoruloideae would conflict with the generic name.

Verona (O.). **A proposito della unificazione dei generi delle 'Torulopsidaceae-Mycotoruleae'.** [On the unification of the genera of the 'Torulopsidaceae-Mycotoruleae'.]—*Mycopathologia*, ii, 2, pp. 122–123, 1939. [English summary.]

After stating that he agrees with the view of Diddens and Lodder that the number of genera included in the Mycotoruloideae should be

reduced [see preceding abstract], the author points out that in 1939 he proposed that *Enantiothamnus* and *Mycotoruloides* should be considered subgenera of *Mycotorula* and that *Candida* should be divided into two subgenera, *Eucandida* and *Mycocandida* [ibid., xiii, p. 186]. *Blastodendrion* and *Redaellia* [ibid., xiv, p. 169] were placed next to *Mycotorula* and *Candida*. In 1935, Ciferri and Redaelli transferred *Redaellia* to the Trichosporeae but accepted *Mycocandida* as valid (*Arch. Mikrobiol.*, vi, 1935). The author agrees with this so far as regards *Redaellia*, but considers that *Mycocandida* should be referred to *Candida*. In his opinion, *Blastodendrion* should be suppressed, as it is of doubtful value and the species in it could be placed in *Torulopsis* or perhaps in *Mycoderma*. Thus, of these genera, only *Mycotorula* and *Candida* remain, in the author's opinion, valid. Some species may have characters in common with both, but this occurs less commonly than is supposed, and when it does happen, such characters tend to bring the fungus nearer to one genus than the other. If only one of the two should remain it should be *Mycotorula*, as the name is earlier than *Candida* and better suited to the characters of these yeasts.

VERONA (O.) & MALAGUZZI-VALERI (O.). **Oidium albicans Robin [Mycotorula albicans (Rob.) Lang. et Tal.] e Monilia pseudotropicalis Castellani [Mycocandida pseudotropicalis (Cast.) Cif. et Red.].** —[*Oidium albicans* Robin [*Mycotorula albicans* (Rob.) Lang. & Tal.] and *Monilia pseudotropicalis* Castellani [*Mycocandida pseudotropicalis* (Cast.) Cif. & Red.].]—*Mycopathologia*, ii, 2, pp. 80–83, 1 fig., 1939. [English summary.]

From cultural, morphological, biochemical, and biological studies of a yeast isolated from the faeces of a child and identified as *Monilia pseudotropicalis* [*R.A.M.*, xvii, p. 319, xviii, p. 525] the authors conclude that the transference of this species to *Mycocandida* as *M. pseudotropicalis* by Ciferri and Redaelli in 1935 is justified. The following synonyms are amongst those listed: *Endomyces pseudotropicalis* Castellani 1910, *Atelosaccharomyces pseudotropicalis* 1918, *Myceloblastanon pseudotropicalis* Ota 1928, *C. pseudotropicalis* Basgal 1931, and *Castellania pseudotropicalis* Dodge 1925 [cf. ibid., xv, p. 367]. An amended description of the fungus is given. Both on solid and liquid media hyphae appear slowly. At first only oval, more or less vacuolate cells are noted, measuring 6·3 to 7·1 by 3·4μ on saccharose agar and 7·1 to 8·8 by 4·4 to 6·3μ on a malt agar. Later on arborescent, budding formations of the *Blastodendrion* type develop, comprising long articulated segments bearing only one terminal blastospore. On Difco glucose agar after 15 days at 24° C. the fungus forms giant, subrotund, white, opaque, creamy, dense colonies with a central boss, occasional radial striae, and a smooth edge. It ferments glucose, levulose, mannose, saccharose, galactose, maltose, lactose, but not raffinose. It assimilates these sources of carbon, and urea, asparagin, peptone, and ammonium sulphate, but not potassium nitrite or nitrate. It does not liquefy gelatine or coagulate milk. It is pathogenic to laboratory animals and man. The species is stated to be distinct from *Mycotorula albicans* [ibid., xvii, p. 817] and *Candida tropicalis* [ibid., xviii, p. 253].

REDAELLI (P.), CIFERRI (R.), & CAVALLERO (C.). **Sul presunto Endomyces albicans Vuillemin.** [On the fungus presumed to be *Endomyces albicans* Vuillemin.]—*Mycopathologia*, ii, 2, pp. 116–121, 2 pl., 1939. [English summary.]

A strain of *Monilia* [*Candida*] *albicans* [cf. preceding abstract] from Illinois was found to be morphologically identical with *Endomyces albicans* Vuill. [*R.A.M.*, xviii, p. 253] or *E. vuillemini*. It was characterized by an early and abundant formation of acrogenous chlamydospores. Vuillemin is believed to have taken the chlamydospores of *M. albicans* to be asci and renamed the fungus *E. albicans*, while Landrieu would appear to have used the name *E. vuillemini* to distinguish an asporogenous form of *M. albicans* from *E. albicans*. Vuillemin's original strain, examined by the authors, was found to be asporogenous. They consider that the Illinois strain, Vuillemin's strain, *E.* [*C.*] *krusei*, and probably *E. pulmonalis* and *E. bonaerensis* as well, are all a variety of *Mycotorula albicans*, which they name *Mycotorula albicans* var. *vuillemini* (Landrieu ex Cast. & Chalm.) Red., Cif., & Cav., n.comb., nine species being listed as synonyms, including *E. albicans* Vuill.

KESTEVEN (H. L.). **The mycotic flora of 'surfer's foot' in Sydney.**—*Med. J. Aust.*, xxvi (i), 11, pp. 420–428, 1939.

The following fungi were isolated in pure culture on Sabouraud's glucose or maltose agar at 35° C. at the Royal Prince Alfred Hospital, Sydney, from the feet of patients suffering from interdigital tinea (misleadingly known as 'surfer's foot'): *Epidermophyton* [*Trichophyton*] *niveum* [ibid., xvi, pp. 179, 535] and its new varieties *closterosporiger* and *coremiger*, *E.* [*T.*] *pedis* [ibid., xviii, p. 678], *E. album* n.sp., *E. flavum* n.sp., *E.* [*T.*] *cerebriforme* [ibid., xviii, pp. 177, 523], *E. macrosporicum* n.sp., *E. interdigitale* var. *rosea* n.var., *E. planum* n.sp., *E. griseum* n.sp., *Ectotrichophyton mentagrophytes* var. *chibaense* Ogata (*Jap. J. Derm.*, xxix, 1929), *Microsporon audouini*, *M. canis* [*R.A.M.*, xviii, p. 393], *Syringospora* [*Candida*] *albicans*, *C. krusei* [ibid., xvi, p. 811 and preceding abstract], *Eutorula excorians* [ibid., xviii, p. 176], a *Cephalosporium* allied to *C. niveolanosum* [ibid., vii, p. 639], and miscellaneous species of *Aspergillus* and yeasts. [The new species and varieties are without Latin diagnoses.]

E. niveum var. *closterosporiger* produces in 16-day-old cultures 3- to 7-septate closterospores, blunted at both ends, 5 to 8 (average 6)μ in diameter, while at 60 days only large, spherical chlamydospores, 10 to 15μ in diameter, were observed. *E. niveum* var. *coremiger* is characterized (24-day-old colonies) by coremia resembling the conidiophores of a small *Penicillium*, with three to five short, oval branchings each bearing one to three aleuriospores, oval (7 to 10 by 2·8 to 3μ) or spherical (3μ in diameter); the basal segments of the coremia measure 11·3 by 3μ and the spherical chlamydospores 5·6μ in diameter. The colonies of *E. album* are snow-white (rose-tinted at two months and pink or cinnamon-brown at 21) and quite opaque; the hyphae average 3μ in diameter, the oval or piriform aleuriophores (attached directly to the hyphae) 3·5 to 2·8μ, and the spherical chlamydospores 8μ (predominantly). *E. flavum* forms colonies of varying shades of yellow at different

ages and is further characterized by spherical aleuriospores, 5 by 3μ, and open spirals with three to six coils (at 18 days). *E. macrosporicum* (isolated from tinea of the scalp) is characterized on maltose agar at seven days by numerous elongated aleuriospores, 8·4 by 3μ, and in older cultures on glucose agar by intercalary chlamydospores, up to 28μ in diameter, and chains of arthrospores 8 to 9μ in length and breadth, developing into large, thick-walled chlamydospores along the length of the hyphae. Old cultures assume a yellow tinge in the centre of the otherwise flat, opaque, white colony and eventually (at 12 months) turn dirty cinnamon-brown. *E. interdigitale* var. *rosea* is stated to differ from the type species only in the colour of the colonies (white and brown zonations with a rose-pink centre) in a 25-day-old culture. *E. planum* forms white, later faintly grey, flat, woolly colonies; on maltose agar the average length of the slender mycelium is 5 to $7·4\mu$, the parallel-sided closterospores, developing singly or in bunches of up to five, with three to six loculi, measure 31·3 by $8·4\mu$, and spherical aleuriospores 2·8 to 3μ in diameter. *E. griseum* is characterized by two types of hyphae, one relatively straight, 3 to $4·2\mu$ in diameter, and the other sinuous, 1·5 to $2·3\mu$, numerous closterospores, 35 to 60 (average 48 to 52) by 6μ, with three to five segments up to 6μ in length, spherical aleuriospores, borne in small, dense clusters on lateral sporophores, $2·5\mu$ in diameter, and spherical arthrospores, $3·5\mu$ in diameter; the colour of the colonies ranges from grey to dusky rose-pink or citron-yellow; a 13-day-old culture on glucose agar is concentrically zonate with fine radiating ridges.

KNIGHTON (H. T.). **A study of Monilia and other yeastlike organisms found in the oral cavity.**—*J. dent. Res.*, xviii, 2, pp. 103–125, 1939.

Among the 105 fungi isolated from the oral cavities of 146 persons at the Louisville (Kentucky) School of Medicine were *Monilia* [*Candida*] *albicans* (69), *M. candida* [*C. vulgaris*: *R.A.M.*, xvii, p. 676] (5), *M.* [*C.*] *krusei* [see preceding abstract] (4), *M. mortifera* [ibid., xvi, p. 811] (2), and two strains of *M.* [*C.*] *parapsilosis* [loc. cit.], one forming acid from sucrose and coagulating milk (4) and the other negative in both these respects (3). *C. albicans* gave positive results in inoculation experiments on rabbits. There was no evidence that the yeast-like fungi were associated with any pathological conditions of the oral cavity in the persons under observation.

COTTINI (G. B.). **Un caso di 'Lingua nigra et pilosa' con isolamento di Mycotorula guilliermondi (Cast.) n.comb.** [A case of 'lingua nigra et pilosa' with isolation of *Mycotorula guilliermondi* (Cast.) n.comb.] —*Mycopathologia*, ii, 2, pp. 75–79, 1 pl., 1939. [English summary.]

From a case of so-called 'lingua nigra et pilosa' (melanoglossitis) affecting the tongue of a 21-year-old male patient in Catania, Sicily, the author isolated a fungus (which he considers as probably saprophytic) identified by Redaelli as *Monilia guilliermondi* [*R.A.M.*, xv, p. 502], but renamed *Mycotorula guilliermondi* (Castellani) Cottini & Redaelli, n.comb.

GHOSH (L. M.). **A case of moniliasis with a secondary allergic patch or 'moniliide'.**—*Indian med. Gaz.*, lxxiv, 8, pp. 476–478, 3 figs., 1939.

The writer describes a case of vulvovaginitis, with secondary manifestations between the toes and on the right arm, caused by *Monilia* [*Candida*] *paratropicalis* [*R.A.M.*, iv, p. 737] in a 20-year-old Hindu woman.

BLENDE (O. J.). **Ringworm of feet: prevention of infection.**—*Northw. Med., Seattle*, xxxviii, 7, pp. 255–257, 1 fig., 1939.

In an article dealing mainly with the prophylaxis of ringworm of the feet, especially among college students, disorders of this nature are stated to have increased by some 400 per cent. during the last two decades in the United States. At the Seattle (Washington) Pacific College in 1938, 76 (87·5 per cent.) of the male students gave positive evidence of infection by various species of *Trichophyton* and *Epidermophyton*, *E.* Kaufmann-Wolf [*R.A.M.*, xvi, p. 809; cf. also xviii, p. 313] being present in 75 per cent. of the cases.

MACKINNON (J. E.). **Aspergillus terreus Thom., parasito del hombre** [*Aspergillus terreus* Thom., a parasite of Man.]—*Mycopathologia*, ii, 2, pp. 127–129, 1 fig., 1939. [English summary.]

A fungus isolated from the ear of a woman in Montevideo, was identified in culture as *Aspergillus terreus* [*R.A.M.*, xv, p. 20], a fungus apparently of common occurrence under Montevideo conditions.

FROILANO DE MELLO (I.) & FERNANDES (L. A.). **Onychomycose du medius et annulaire dûe à une levure du genre Torulopsis Berlese 1894.** [Onychomycosis of the middle and ring fingers due to a yeast of the genus *Torulopsis* Berlese 1894.]—*Mycopathologia*, ii, 2, pp. 124–126, 1939.

From lesions on the middle and ring fingers of the left hand of a female patient at Nova Goa the authors isolated an unidentified species of *Torulopsis*, which clinical evidence showed to be parasitic.

MARZOLLO (E.). **Paronychie und Onychie mit eigenartiger Färbung der Nagelplatten, verursacht durch Cryptoccocus interdigitalis Pollacci und Nannizzi.** [Paronychia and onychia, with peculiar coloration of the nail-beds, caused by *Cryptococcus interdigitalis* Pollacci & Nannizzi.]—*Arch. Derm. Syph., Berl.*, clxxviii, 4, pp. 381–394, 3 figs., 1939.

A detailed account is given of a case of paronychia and onychia, accompanied by transverse black striations of the nail-beds of two fingers of the right and one of the left hand in a 25-year-old woman at Genoa, Italy. The fungus in pure culture budded off numerous conidia, some thin-walled and circular, 3·5 to 5·5μ in diameter, and others round or oval, 6 to 8·5 by 5·5 to 7μ, with a much thickened membrane: it is identified as *Cryptococcus interdigitalis* [*R.A.M.*, vi, p. 483] and is considered to be directly responsible for the very remarkable disturbance under observation.

GRECO (N. V.), BIGATTI (A.), PONCE DE LEON (S.), & CAPURRO (J.). **Localización anómala de enfermedad de Kaposi (sarcoma idiopático múltiple hemorrágico), diagnosticada investigando el Cryptococcus haematicon en la sangre.** [An exceptional site for Kaposi's disease (idiopathic multiple haemorrhagic sarcoma) diagnosed by the investigation of the blood for *Cryptococcus haematicon.*]—*Sem. méd., B. Aires*, xlvi, 4, pp. 178–185, 13 figs., 1939. [French summary.]

The writers detected *Cryptococcus haematicon*, associated with Kaposi's disease [*R.A.M.*, xviii, p. 594], in the blood stream of a 36-year-old male Italian resident in Buenos Aires and suffering for three years past from sarcomatosis of the right retroauricular groove.

SHAFFER (F. J.), SHAUL (J. F.), & MITCHELL (R. H.). **Histoplasmosis of Darling : fourth case to be reported in United States.**—*J. Amer. med. Ass.*, cxiii, 6, pp. 484–488, 4 figs., 1939.

A full clinical description is given of a fatal case of Darling's histoplasmosis [*Histoplasma capsulatum*: *R.A.M.*, xviii, p. 456] in an eleven-month-old female infant in Virginia, stated to be the fourth record of the disease for the United States.

MARTIN (D. S.) & SMITH (D. T.). **Blastomycosis (American blastomycosis, Gilchrist's disease). I. A review of the literature. II. A report of thirteen new cases.**—*Amer. Rev. Tuberc.*, xxxix, 3, pp. 275–304; 4, pp. 488–515, 5 pl., 1 graph, 1 map, 1939.

From a perusal of the relevant literature and from the observation of 13 patients of their own, the writers conclude that American blastomycosis or Gilchrist's disease is a distinct clinical entity caused by a specific etiological agent, *Blastomyces* [*Endomyces*] *dermatitidis* [*R.A.M.*, xviii, p. 800], which develops in two forms, cutaneous (chronic) and systemic (acute and fatal).

DEBUSMANN (M.). **Über das Vorkommen eines seltenen Pilzes (Cephalosporium acremonium Corde) im Blut bei tonsillogener Sepsis.** [On the occurrence of a rare fungus (*Cephalosporium acremonium* Corda) in the blood in tonsillogenic sepsis.]—*Arch. Kinderheilk.*, cxvi, 3, pp. 172–179, 6 figs., 1939.

Clinical details are given of a case of sepsis following tonsillectomy in a nine-year-old girl at the Bonn (Germany) Children's Hospital in 1938, in the etiology of which *Cephalosporium acremonium*, obtained in pure culture from the patient's blood, is assumed to have been implicated [*R.A.M.*, xvii, p. 242; xviii, p. 180].

GALLOWAY (L. D.). **The minimum moisture regain for the development of micro-organisms on Jute.**—*J. Text. Inst., Manchr*, xxx, 8, pp. T127–T130, 1 fig., 1939.

Experiments conducted to determine the minimum moisture regain for the development of moulds [unspecified] on jute, showed that the safe limit for the moisture content of stored jute is 17 per cent., in equilibrium with about 80 per cent. relative atmospheric humidity.

In converting the safety limit into terms of moisture content the regain must be calculated on the dry weight of the fibre, exclusive of added oil. The result refers to uniform moisture distribution, but in practice, jute with an overall regain of 17 per cent. might have a local excess inducing mildew. The critical regain should, generally, be independent of temperature, though below 15° C. mould growth is appreciably retarded, and the safe regain may be a very little higher. In the case of jute stored in a closed space, the presence of a musty odour is quite a delicate test for the presence of mildew. Jute contains a large and variable number of bacterial spores, but bacterial growth only occurs at high regains, i.e., exceeding 20 per cent.

JAHNEL (H.). **Grauschimmel und Wurzelbräune an Flachs.** [Grey-mould and root browning of Flax.]—*Kranke Pflanze*, xvi, 7–8, pp. 132–134, 1 fig., 1939.

In tests at Dresden, Germany, to determine the effects of varying soil reactions on root development in flax, the fibre variety Daros II was so greatly weakened by excessive acidity (P_H 4·3) that it sustained severe damage from infection by *Botrytis cinerea* [*R.A.M.*, xvi, p. 612; xviii, p. 315], which reduced the plants to a third of their normal height and caused many gaps in the stand. In another series of experiments *Thielavia* [*Thielaviopsis*] *basicola* [ibid., xvi, p. 611] produced 10 to 15 and 3 per cent. infection, respectively, on Konkurrent and Daros II. The fungus, first recorded on flax in Germany by Peters in 1921 (*Ber. biol. Anst.* (*Reichsanst.*), *1920*, pp. 63–74), is thought to be commonly overlooked through confusion of the symptoms caused by it with those of other pathogens, including *Fusarium*. The brownish-black resting conidia are believed to persist for considerable periods in the soil, and care should be taken to eradicate the alternate weed hosts of the fungus, *Senecio vulgaris* and *Chenopodium album*, from the crop preceding flax in the rotation.

BIJL (J. P.) & VAN SLOGTEREN (E.). **Serologische Untersuchung bei Narzissen, welche an einer Viruskrankheit leiden.** [The serological investigation of Narcissi suffering from a virus disease.]—*Zbl. Bakt.*, Abt. 1 (Orig.), cxliv, 1–5, pp. 109–110, 1939.

The serological reactions of rabbits to intravenous juice injections provided a means of differentiating virus-diseased (grey-striped) Sir Watkin [daffodils] (*Narcissus*) [*pseudonarcissus*: *R.A.M.*, xviii, p. 680] from healthy ones in experiments at Utrecht, Holland. Similar results were obtained with grey-striped Croesus, Waveren's Giant, and King Alfred, whereas the juices of a silver-mottled King Alfred, a grey-striped Minister Talma, and a mosaic Sion elicited a negative response, possibly denoting the agency of another virus in the etiology of these disorders.

MCWHORTER (F. P.). **The white streak or white stripe disease of Narcissus.**—Abs. in *Phytopathology*, xxix, 9, p. 826, 1939.

The mid-season symptoms of a transmissible *Narcissus* disease, presumably of virus origin, in the United States include prominent white and purple, longitudinal streaks on the foliage. High temperatures

tend to mask the purple and intensify the white markings. The disturbance was shown by histological examination to be quite different from yellow streak or mosaic [see preceding abstract], the white streaks being dead areas of sunken epidermal or chlorenchyma cells, while the yellow or mosaic stripes are raised overgrowths of living cells.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 8, pp. 439–443, 5 figs., 1939.

No injurious effect resulted to gladiolus corms with sprouts ½ to 2 in. long following treatment against scab (*Bacterium marginatum*) [*R.A.M.*, xviii, p. 113] by dipping for 15 hours, 10 minutes, and 5 minutes, respectively, in mercuric chloride (1 oz. to 6¼ galls. water), acidulated mercuric chloride (the same, with ½ pint commercial hydrochloric acid added), and mercurous chloride (1 oz. to 1½ pints water), the corms being dried and planted on the same day in the case of the first treatment, and six days after in that of the others. Growers in New South Wales may safely employ any of these methods (the standard time for the mercuric chloride dip being eight hours) in cases where treatment has been unavoidably delayed until sprouting has begun.

SEVERIN (H. H. P.) & OLIVER (S. J.). **Delphinium Aster yellows.**—Abs. in *Phytopathology*, xxix, 9, p. 826, 1939.

Adults of the two species of leafhopper chiefly concerned in the dissemination of the California aster yellows virus to garden varieties of the perennial *Delphinium*, viz., *Thamnotettix montanus* and *T. geminatus*, were collected on naturally infected *Delphinium* and transferred to healthy ones, 84·6 of which contracted the disease from the former insect and 92·3 from the latter. The recovery and transfer of the virus from naturally infected *Delphinium* to healthy celery [*R.A.M.*, xiv, pp. 171, 313] by previously non-infective *T. montanus* and *T. geminatus* amounted to 20·8 and 4·2 per cent., respectively. In inoculation tests on healthy *Delphinium* with the two leafhoppers, seedling and second-year plants before the spikes developed acquired the virus to the extent of 100 per cent., and to that of 90 per cent. after this stage. The average incubation periods of the virus in seedlings and in second-year plants before and after spike development were 19·5, 43·5, and 45 days, respectively. In the course of these experiments the virus was recovered and transmitted from 10·9 per cent. of the infected *Delphinium* plants to healthy aster [*Callistephus chinensis*: ibid., xvii, p. 126] or celery.

THIRUMALACHAR (M. J.). **Rust on Jasminum grandiflorum.**—*Phytopathology*, xxix, 9, pp. 783–792, 3 figs., 1939.

The autoecious rust, *Uromyces hobsoni* Vize (*J. Indian bot. Soc.*, x, pp. 195–204, 1931), originally referred by Barclay (1891) to *U. cunninghamianus*, is reported to occur on *Jasminum grandiflorum*, *J. arborescens*, and *J. officinalis* in India, and on an unidentified *J.* sp. in Somaliland. It forms on the leaves, stems, flowers, and rarely on the fruits orange, later brownish-black, swollen, pustulate cushions during the monsoon rains of July to August and persists until the following March. The affected flower buds swell, and large, oval cankers develop on the green stems and twigs. The aecidia, pycnidia, and teleutosori are produced

side by side on the hypertrophied organs, uredosori being absent. The aecidia and teleutosori were frequently observed to arise within the pycnidial cup. On germination the aecidiospores give rise to a bicellular germ-tube tapering off into one or two whip-like structures of the nature of appressoria. The teleutospores germinate without rest, forming three to four binucleate basidiospores, secondary and tertiary sporidial production also being observed. A revised description of the rust is appended. Inoculation experiments on *J. grandiflorum* resulted in the production of secondary aecidia.

NOBLE (MARY). **Notes on Pullularia pullulans in Ryegrass seed and seed-testing methods as affecting detection of certain seed-borne diseases.**—*Ann. appl. Biol.*, xxvi, 3, pp. 630–633, 1939.

Samples of seed of *Lolium perenne* and *L. italicum* from Ireland, Ayrshire, and Aberdeenshire showed the presence of *Pullularia* [*R.A.M.*, xviii, pp. 186, 601]. When infected seeds were placed in a drop of water, hyaline, oblong spores measuring roughly 12 by 2μ floated off in large numbers, but all attempts to germinate them failed. Cultures from mycelium within the seed produced masses of pink or buff-coloured spores which proceeded to bud freely. The hyphae were at first hyaline, but became opaque and brown, and had thickened walls; dark brown chlamydospores were formed more slowly. All these features agree well with Bennett's description of *Dematium* [*Pullularia*] *pullulans* [ibid., viii, p. 67], and it would appear fairly certain that the organism observed is *P. pullulans*, though whether it is responsible for the death of rye grass seed in Great Britain has not yet been determined.

In tests of the germinative capacity of infected seeds, 50 opaque and 50 translucent seeds from the same sample produced, respectively, 2 and 40 seedlings. Of the opaque seeds which failed to grow, 45 were heavily and three slightly infected, while one of the two that grew was slightly infected. Of the translucent seeds which grew, 35 were uninfected, while of those failing to germinate five were infected. In further tests only about 15 to 17 per cent. of infected (opaque) seeds grew. In one experiment, 'very dark' and 'dark' seeds gave, respectively, 8 and 40 per cent. germination, indicating that the degree of infection is shown by the degree of opacity. In another test the germination percentages of opaque and translucent seeds were 17 and 84, respectively.

LISSITZINA (Mme M. I.). К селекции Клевера на устойчивость к клеверному раку. [On the selection of Clover resistant to rot.]—*Селекция и семеноводство* [*Selection & Seed Growing*], *1939*, 5, pp. 25–26, 1939.

In field inoculation tests, extending over three years, of clover varieties for resistance to rot [*Sclerotinia trifoliorum*: *R.A.M.*, xviii, p. 684] at the Timiryazeff Academy of Agriculture, U.S.S.R., the highest degree of resistance was exhibited by the variety Yaroslavsky and its hybrid Konishtshevsky, which showed 34·8 and 41 per cent. of rotted plants, respectively, compared with infection percentages varying from 51·4 to 81·1 in seven susceptible varieties.

THOMAS (H. E.) & LAWYER (L. O.). **The use of carbon disulphide in the control of Armillaria root rot.**—Abs. in *Phytopathology*, xxix, 9, pp. 827–828, 1939.

A low soil moisture content was found to be the most important single factor in the eradication of *Armillaria mellea* from orchards in three years' experiments to determine the utility of carbon disulphide for this purpose. The fungus may be destroyed to a depth of 60 in. under a wide range of conditions by the application of 45 c.c. of the compound 8 to 9 in. deep at distances of 18 in. apart, while with low soil moisture and a surface blanket of moistened earth 3 to 6 in. in depth it was completely eliminated down to 70 or 80 in. A period of from 30 to 60 days, however, is necessary for the total extermination of the fungus from all the roots. The results indicate that the eradication of the fungus from orchard soils may be possible under ideal conditions.

GILLESPY (T. G.). **Studies on the mould Byssochlamys fulva. II.** *Rep. Fruit Veg. Pres. Sta., Campden, 1938*, pp. 68–78, 1939.

In further studies on *Byssochlamys fulva*, an agent of spoilage in canned and bottled fruit in England [*R.A.M.*, xviii, p. 191], the author determined the resistance to heat of the ascospores of the fungus by a method which is described in detail. Untreated ascospores of *B. fulva* were found to germinate very slowly and irregularly, the percentage after three days at 37° C. probably not exceeding 20 per cent. The average survival percentages after ten minutes' heating at 75° were 38 and 100 in distilled water and on potato sucrose agar, respectively, the corresponding figures for 30 minutes at 80° being 21 and 50, respectively. The ascospores resisted heat best at P_H 5, and the protective effect of sucrose in solutions is shown by the survival of nearly 10 per cent. after twelve minutes' heating in fruit syrups at 90°. The ascospores were totally destroyed by intermittent heating, viz., two periods of ten minutes each at 77°, separated by 30 minutes at 46°, whereas 38 per cent. withstood continuous exposure to 77° for 20 minutes.

ROSE (D. H.), BRATLEY (C. O.), & PENTZER (W. T.). **Market diseases of fruits and vegetables: Grapes and other small fruits.**—*Misc. Publ. U.S. Dep. Agric.* 340, 26 pp., 10 (1 col.) pl., 1939.

This is a comprehensive, well-illustrated account of the market diseases of grapes and other small fruits in the United States, embodying much useful information already noticed in part from other sources. Blackberries, dewberries, and currants are subject to two rots which also affect grapes, viz., blue mould (*Penicillium* sp.) and grey mould (*Botrytis*) [*cinerea*: *R.A.M.*, xviii, p. 804]. In connexion with the mode of infection of grapes by the latter organism, it is mentioned that the spores frequently enter through sites where juice escapes when the berries are broken under pressure in tightly crowded bunches. Under cool, damp conditions in California the fungus may cause decay of the flowers, pedicels, and young berries. The form of grey mould known as 'slip skin' is a shallow epidermal infection prevalent on Late Emperors in the vineyard and in storage following autumn rains. The control of *B. cinerea* in transit depends on careful handling, refrigeration at 40° to 45° F., and prompt movement of all consignments from field

to market. For keeping varieties the storage temperature may well be 1° to 2° below the standard of 32°, their freezing point averaging about 25°. Sulphur dioxide fumigation [ibid., xiv, p. 491] is also advisable, but may cause injury [ibid., xviii, p. 467] at unduly high concentrations or if applied for protracted periods, the Castiza (Red Malaga) and Emperor varieties being more susceptible than Ribier and Alicante Bouschet. The damage may assume two different forms, a bleaching of the skin of the fruit or a dulling of the colour without bleaching. The skin and underlying flesh of the stem-end may dry out and collapse, forming small depressions simulating incipient decay. A period of up to 24 hours may elapse before the symptoms of fumigation injury become apparent.

Other grape diseases include anthracnose (*Gloeosporium ampelophagum*) [*Elsinoe ampelina*: ibid., xviii, p. 502]; black measles [ibid., v, pp. 282, 467], most prevalent on Malaga, Emperor, Alexandria (Muscat), Burger, Carignane, and Alicante Bouschet; black mould (*Aspergillus niger*) [ibid., xv, p. 701], causing losses of up to 20 per cent. in California on varieties forming tight bunches and controllable by the measures recommended against *B. cinerea*; black rot (*Guignardia bidwellii*) [ibid., xviii, p. 478], occurring throughout the United States, except in California; cracking of the blossom-end or side, especially in the Flame Tokay, Ribier, and Castiza varieties, which gives ingress to various pathogens; downy mildew (*Plasmopara viticola*); green mould (*Cladosporium*, *Alternaria*, and *Hormodendrum* spp.), developing as a firm, black rot, occasionally covered with a sparse, greyish-green growth, on Emperor and other storage grapes after three or four months' keeping; internal browning of Malagas in California, a condition analogous to that of the Ohanez variety (commonly known as Almeria), consisting of faint purple or grey, slightly sunken superficial lesions and underlying brown areas in the flesh; powdery mildew (*Uncinula necator*), occurring in the market almost exclusively on Californian grapes of the Flame Tokay, Carignane, Alexandria, Olivette de Vendemain, and Petite Syrah varieties, Alicante and Petit Bouschet and Mataro being resistant; *Rhizopus* rot (*R. nigricans*); ring or fingerprint mildew of Malaga and Alexandria, the cause of which is unknown; shot berry of Sultanina, Malaga, Muscat, and Emperor, which produce small, poorly developed fruits among those of normal size, probably as a result of imperfect pollination; water berry [ibid., ii, p. 438], characterized by softness, wateriness, and an abnormally low sugar content of the Malaga, Flame Tokay, Sultanina, and Emperor varieties; and a variant of the same condition, known as red berry, affecting Zinfandel, Cornichon, Mission, and other black varieties and inducing the development of a dull red colour.

Fungal rots of cranberries [including *Glomerella cingulata* var. *vaccinii*, *Sporonema oxycocci*, and *Diaporthe vaccinii*: ibid., xv, p. 817] are estimated to cause a loss of 25 per cent. of the crop between the grower and the consumer.

Gooseberries suffer heavy damage from powdery mildew (*Sphaerotheca mors-uvae*) in all parts of the United States.

A species of *Cladosporium* is responsible for an olive or olive-green mould of raspberries, controllable by the precautions recommended for

grape rots, which are also applicable to *B. cinerea* on strawberries. The latter fruit is also widely attacked by *Phytophthora cactorum*, the agent of leather rot [ibid., xi, p. 559; xvi, p. 584, *et passim*], for the control of which shipments should be pre-cooled to between 35° and 40° and kept below 40° in transit; a species of *Rhizoctonia* [ibid., xvi, p. 822] in central Florida, North Carolina, Tennessee, and Arkansas; *Rhizopus nigricans* [ibid., xvi, p. 264; xviii, p. 191], the critical temperature for the development of which in transit or on the market is 50°, 2° to 3° above permitting infection, while at the corresponding intervals below the product is fairly safe; a *Sclerotinia*, probably *S. libertiana* [*S. sclerotiorum*: ibid., xiv, p. 776]; and *Pezizella lythri* [ibid., xi, p. 252], causing tan-brown rot in Cuba, Louisiana, Florida, Arkansas, Tennessee, Virginia, Maryland, Wisconsin, and Alaska.

OSTERWALDER (A.). **Versuche zur Bekämpfung des Schorfes und der Schrotschusskrankheit im Jahre 1938.** [Experiments in the control of scab and shot hole disease in the year 1938.]—*Schweiz. Z. Obst- u. Weinb.*, xlviii, 16, pp. 290–302, 1939.

Under the conditions prevailing in 1938 in the Wädenswil district of Switzerland, no consistent advantage in the control of apple scab [*Venturia inaequalis*] on a number of well-known varieties was derived from the inclusion in the spray schedule of a post-blossom application of 1 per cent. sulfo (equivalent to 2 per cent. lime-sulphur) [*R.A.M.*, xvi, p. 542] on 26th June in addition to others on 27th May, 26th July, and 9th September. Storage infection occurred in a severe form despite special protective applications on London Pippin and Boiken, suggesting the advisability of a reversion to the former strength of 3 per cent. lime-sulphur for the late treatment.

Excellent control of *V. inaequalis* on Boskoop and Golden Pearmain apples, of pear scab [*V. pirina*] on Hardenpont's Winter Beurré, and of shot hole [*Clasterosporium carpophilum*] on the susceptible Bing cherry [ibid., xvi, p. 388] was given by the application on 21st March of a combined dormant and blue spray, okamito+rekato (5 per cent. carbolineum+5 per cent. of a special adhesive Bordeaux mixture containing casein), manufactured by Chem. Tech. Werke, Muttenz, followed on 20th June by 1 per cent. sulfo+calcium arsenate and on 26th July by the former alone. The yield of sound apples was increased from 49·4 to 85·9 per cent. on Boskoop and from 40·6 to 82·9 per cent. on Pearmain, while the percentage of healthy pears rose from 6·4 to 85·7 per cent. as a result of the treatment, the beneficial effects of which in the case of cherry were mainly restricted to the foliage, April frosts having destroyed the bulk of the fruit.

The results of experiments in apple and pear scab control by means of pomarsol (Ob 72) [ibid., xviii, p. 603] were not altogether conclusive, while burseen XI and fungicinol+zonol were definitely unsatisfactory.

MUNSON (R. G.). **Observations on Apple canker. I. The discharge and germination of spores of Nectria galligena Bres.**—*Ann. appl. Biol.*, xxvi, 3, pp. 440–456, 1 pl., 1 fig., 3 graphs, 1939.

After stating that the macroconidial measurements and other characters [details of which are given] of three strains of the fungus causing

apple canker at Long Ashton showed it to be identical with *Nectria galligena*, the author gives an account of field and laboratory studies from October, 1936, to October, 1937, which demonstrated that ascospore discharge occurs at all seasons in rainy weather, reaching an optimum in February, falling to a minimum in September, and rising steeply again in October and November. Discharge ceases when the perithecia are no longer saturated, but is not retarded by cold until the temperature falls below 5° C.

Ascospore germination occurred under experimental conditions at temperatures ranging from 2° to 30°, with an optimum at 20°, in many cases reaching over 95 per cent. At 25°, germination began in two to three hours, and was complete in six to eight hours. At lower temperatures it occurred more slowly, though even at 2° it was not inhibited. At 15°, germ-tubes up to 300μ long were present after 24 hours. In culture, the vegetative mycelium grew slowly at 2°.

The potential infective ability of cankered wood in relation to adjacent shoots and trees in the vicinity was clearly demonstrated by the large numbers of ascospores found on vaselined slides placed close to the cankers. The prompt removal of such sources of infection is therefore highly important in control.

Marsh (R. W.). **Observations on Apple canker. II. Experiments on the incidence and control of shoot infection.**—*Ann. appl. Biol.*, xxvi, 3, pp. 458–469, 2 figs., 1939.

In studies carried out at Long Ashton from 1936 to 1938, inoculations with *Nectria galligena* [see preceding abstract] on unwounded shoots of Cox's Orange Pippin apples demonstrated that canker infections through leaf scars may be initiated in October and April, but not in November and January. Shoots sprayed before inoculation with a Bordeaux-casein-oil mixture showed much less infection than unsprayed shoots. Similar inoculations on pruning cuts during November to April showed that freshly made cuts on apple shoots are liable to become infected throughout the dormant season. Pruning cuts made in autumn and winter acquired natural immunity within two months, whereas wounds made in March, 1938, were relatively susceptible in the following May. The most promising wound protectant tested was a mixture of monohydrated copper sulphate, hydrated lime, and linseed oil in the proportion of 5 gm., 10 gm., and 9 ml., which in a limited number of field tests completely prevented infection from inoculum applied to the treated surface.

The critical periods for leaf scar infection being in the spring and autumn, it is suggested, on the basis of the results obtained, that the addition of Bordeaux mixture to the petroleum oil emulsion at present applied in March might prove advantageous, as well as an autumn application, to nursery stock and young trees of susceptible varieties after leaf fall, of Bordeaux mixture with an oil emulsion. Pruning should be carried out in dry, frosty weather. Late pruning is not favourable to control.

[An abridged account of the work described in this and the preceding paper appears in *Rep. agric. hort. Res. Sta. Bristol, 1938*, pp. 78–83, 1939.]

Miller (P. R.). **Pathogenicity, symptoms, and the causative fungi of three Apple rusts compared.**—*Phytopathology*, xxix, 9, pp. 801–811, 3 figs., 1939.

The available knowledge concerning the symptomatology, pathogenicity to individual varieties, geographical distribution, and morphological characters of three American apple rusts, *Gymnosporangium juniperi-virginanae*, *G. globosum*, and *G. clavipes* [*R.A.M.*, xviii, p. 533, much of which has already been noticed from other sources], is discussed and presented in tabular form. The aecidiospore dimensions of the three rusts, based on collections from Indiana, New York, Arkansas, Tennessee, and Virginia, are given as 21 to 31 by 16 to 24 (mostly 27 by 22)μ, 18 to 25 by 15 to 19 (21 by 18)μ, and 24 to 39 by 21 to 32 (31 by 25)μ, respectively; those of *G. juniperi-virginianae* and *G. globosum* are dark brown (in the mass) and finely verrucose, those of *G. clavipes* bright orange and coarsely warted. The teleutospores of *G. juniperi-virginianae* are rhombic-oval and measure 42 to 65 by 15 to 21μ, while those of the other rusts are ellipsoid, 37 to 48 by 18 to 21 and 35 to 51 by 18 to 26μ, respectively, the colour of the walls being cinnamon-brown in *G. juniperi-virginianae* and *G. globosum* and yellowish in *G. clavipes*.

The evidence regarding varietal reactions to the three rusts in different States is very conflicting, probably because earlier workers generally failed to distinguish between the species involved. In the writer's inoculation experiments the York, Grimes, Rome, and Ben Davis varieties were susceptible to *G. juniperi-virginianae* and *G. globosum* but resistant to *G. clavipes* except for one physiologic race attacking Rome; Wealthy was attacked by all three rusts; Stayman and Winesap only by *G. clavipes*; Maiden Blush only by *G. globosum*; and Jonathan by *G. globosum* and (on the leaves) *G. juniperi-virginianae.*

Miller (P. R.). **The relation of aeciospore germinability and dissemination to time of infection and control of Gymnosporangium juniperi-virginianae on Red Cedar.**—*Phytopathology*, xxix, 9, pp. 812–817, 1 graph, 1939.

The results of monthly tests from August to June, 1933 to 1937, inclusive, on aecidiospore germination in the apple rust, *Gymnosporangium juniperi-virginianae* [see preceding abstract], on potted red cedar (*Juniperus*) [*virginiana*] seedlings under controlled conditions showed that the August percentage is low (maximum of about 12 per cent. in 1933), a peak being reached some time during the late winter (80 per cent. in March, 1933, 60 per cent. in February, 1934, 50 per cent. in January, 1935, and 65 per cent. in December, 1936). The dissemination of the aecidiospores takes place chiefly from July to September. Red cedars probably pass through two distinct periods of liability to infection, the first soon after the release of the aecidiospores, when germination is scanty, and a second, some time later, possibly in early spring, following the germination of the overwintered aecidiospores. Theoretically, therefore, the application of a fungicide to junipers during the dormant period should afford protection against spring attacks, and preliminary experiments by MacLachlan and Crowell along these lines did actually give promising results [*R.A.M.*, xvi, p. 618].

Kemp (H. H.) & Beare (J. A.). **The effect of water core on the keeping quality of Apples.**—*J. Dep. Agric. S. Aust.*, xliii, 1, pp. 22–28, 2 figs., 1 diag., 1 graph, 1939.

Two experiments were conducted at Adelaide to determine the effect of late water-core on the keeping quality of Rokewood apples [*R.A.M.*, xviii, p. 687] destined for export overseas, the first with unsorted fruit and the second with apples graded for the disease over a strong white light. The trouble disappeared to a considerable extent in storage, declining in the first test from 43·8 and 63·7 per cent. for apples graded 210 and 158 to the bushel, respectively, to 2·6 and 8·5 per cent., respectively, after six weeks' storage at 32° F. and three at 55° to 65°, the corresponding figures for those stored in the shed for six weeks and for three at 55° to 65° being 0·3 and 2·6, and at 40° for six weeks and three at 55° to 65°, 1·5 and 10·5. In the second test, the incidence of water-core declined during 15 weeks' storage at 32° from 25 to 4 per cent., while at 40° only isolated fruits were found to be diseased after four weeks and none after eight. The development of internal breakdown [ibid., xviii, p. 187], apparently following water-core (9·2 and 12·8 per cent., respectively, in the two grades in the first test), was, however, a disturbing feature of the results and it is considered inadvisable to use apples affected by late water-core for refrigerated storage or export.

Pohl (M.). **Die Schädigungen in Pflaumenanbau durch die Monilia.** [Damage to Plum cultivation by *Monilia*.]—*Obst- u. Gemüseb.*, lxxxv, 8, pp. 95–97, 1939.

The severe damage caused in German plum orchards, especially in districts with a heavy rainfall, by *Monilia* [*Sclerotinia laxa* and *S. fructigena*: *R.A.M.*, xviii, p. 508] cannot be effectively combated by chemical treatment, and attempts should therefore be made to reduce the incidence of the disease by preventive measures. Among resistant varieties are the blue house plum, Czar, Victoria, Kirke's, Prince of Wales, and Althans greengage. Organic manure should be very sparingly used, stone fruits responding more favourably to lime, phosphoric acid, potash, and minerals in general. *S. laxa* flourishes on trees in protected situations, where drastic thinning-out of the crowns and pruning of the long, bare lateral branches is indicated. Another measure contributing to control consists in the removal of a large proportion of the superabundant fruits. Hornets and wasps are active in the spread of infection and should be trapped.

Askew (H. O.) & Thomson (R. H. K.). **Boron status of New Zealand Apples.**—*N.Z. J. Sci. Tech.*, A, xxi, 2, pp. 128–129, 1939.

All the apple samples from the Auckland, Hawke's Bay, Marlborough, and Canterbury districts of New Zealand revealed a satisfactory boron status on analysis (15 to 23 p.p.m.), whereas all but two of those from Central Otago, though free from internal cork [*R.A.M.*, xviii, pp. 117, 725], were somewhat low in boron (9 to 19, mostly 12 to 15 p.p.m.). Even these figures, however, are higher than those reported for fruit suffering from the disorder in question in Central Otago and Nelson.

ASKEW (H. O.) & LLOYD WILLIAMS (W. R.). **Brown-spotting of Apricots, a boron-deficiency disease.**—*N.Z. J. Sci. Tech.*, A, xxi, 2, pp. 103–106, 1 fig., 1939.

Apricots on light-textured schist soils on the banks of the Clutha River, New Zealand, are liable to develop a brown-spotting of the flesh, especially near the stem-end, accompanied by a dry, spongy condition surrounding the stone. In experiments in 1938 on the Newcastle variety good control was obtained by the use of hydrated borax, either as a 0·1 per cent. spray, applied on 20th October and 10th November ($11\frac{1}{2}$ gals. per 12 trees on the first date and $10\frac{1}{2}$ on the second), or as a top-dressing at the rate of $\frac{1}{2}$ lb. per tree. The marked increase in the boron content of the leaves and fruit (32 and 34·5 p.p.m., respectively, in the sprayed, and 40·5 and 46·5 p.p.m., respectively, in the top-dressed series, as compared with 12·5 and 5·7, respectively, in the untreated controls) was found to be positively correlated with freedom from brown-spotting of the flesh. McLarty and Wilcox have reported (*Country Life in B.C.*, xx, December, p. 7, 1936) similar beneficial results from the application of boron in the control of drought spot of apricots in British Columbia.

[An account of these experiments is also given in *N.Z. J. Agric.*, lix, 3, pp. 229–230, 1 fig., 1939.]

KEITT (G. W.) & CLAYTON (C. N.). **A destructive bud-transmissible disease of sour Cherry in Wisconsin.**—*Phytopathology*, xxix, 9, pp. 821–822, 1939.

A prevalent disorder of sour cherries (*Prunus cerasus*) in Wisconsin, known as 'yellow leaf', 'physiological yellow leaf', or 'border tree', is characterized by somewhat large, sometimes chlorotic leaves, which are shed in late June or early July, a much reduced spur system, and a very sparse crop. The condition was transmitted from diseased to healthy Montmorency trees in budding experiments in 1938–9, typical foliar symptoms developing on shoots from sound buds placed on diseased trees, as well as on shoots from diseased buds inserted on healthy trees. The disease is tentatively attributed to a virus.

GONÇALVES (R. D.). **A 'entomosporiose' e o desaparecimento da cultura do Marmeleiro.** ['Entomosporiosis' and the disappearance of the Quince from cultivation.]—*Biologico*, v, 8, pp. 153–157, 1 pl., 1939.

A popular account is given of the symptoms caused by *Entomosporium maculatum*, the conidial form of *Fabraea maculata* [*R.A.M.*, xviii, p. 532], on the leaves and fruits of quinces in São Paulo and other parts of Brazil, where the disease is stated to be the primary factor in the gradual disappearance of the crop from cultivation. Apart from the semi-resistant Japanese quince, grown chiefly as an ornamental, all varieties seem to be more or less susceptible to the fungus. Good control has been obtained in experimental plantings by a dormant spray of lime-sulphur (1 in 8), followed by three spring treatments with 1 or 2 per cent. Bordeaux mixture, the first at the onset of growth, the second at petal-fall, and the third two to three weeks later, similar intervals being allowed to elapse between any further applications

necessitated by adverse weather conditions or the severity of the disease.

Boresch (K.). **Weitere Untersuchung der durch Chloride hervorgerufenen Blattrandkrankheit der Johannisbeere.** [A further investigation of the Currant leaf margin disease caused by chlorides.] —*Bodenk. u. PflErnähr.*, N.F., xiv, 3–4, pp. 230–247, 3 figs., 1939.

A fully tabulated account is given of the writer's further experiments at the Tetschen-Liebwerd (Germany) Agricultural College to determine the nature of the metabolic disturbance induced in red currants by chloride fertilizers and expressed by marginal leaf scorch [*R.A.M.*, xviii, p. 39], the results of which revealed a potash-calcium antagonism as the underlying cause of the trouble. In a pot test involving the application of increasingly heavy doses of lime and sodium chloride, red currants and *Ribes alpinum* proved sensitive to both, while black currants were unharmed. The Dutch Red variety is more susceptible to marginal leaf scorch than the cherry currant. The suspected relationship between lime and chlorine antagonism is considered to be confirmed by the outcome of these studies.

Huber (G. A.). **Transmission of Black Raspberry mosaic by the cane-feeding aphid, Amphorophora rubicumberlandi.**—Abs. in *Phytopathology*, xxix, 9, p. 825, 1939.

A cane-feeding aphid, *Amphorophora rubicumberlandi*, recently detected both on wild (*Rubus leucodermis*) and cultivated (Cumberland variety) black raspberries in the Puget Sound area of western Washington, transmitted mosaic [*R.A.M.*, xviii, pp. 236, 325, 442] from the former to the latter host in 30 per cent. of the inoculated plants, and from diseased to healthy Cumberlands in 50 per cent.

Zeller (S. M.). **Stamen blight of Blackberry caused by Hapalosphaeria deformans.**—Abs. in *Phytopathology*, xxix, 9, p. 829, 1939.

Hapalosphaeria deformans [*R.A.M.*, xv, p. 817] probably enters the winter buds of blackberry during March between the leaf-like scales and infects the anthers superficially within the calyx, inducing complete emasculation. Long before the opening of the flower buds a fungal pseudoparenchyma entirely surrounds the pollen locule and parasitizes the grains. The pycnidia produced from the surface of the pseudoparenchyma become erumpent and emit coils of spores from the anther surfaces. Emasculated flowers may produce deformed berries through bee pollination. In addition to Boysenberry and youngberry [a hybrid dewberry], *Rubus laciniatus* and *R. macropetalus* have been found infected in Oregon.

Bunchy-top control. Upper Richmond area.—*Banana Bull., Sydney*, i, 39, p. 15, 1939.

H. W. Eastwood states that, although the prohibition against planting bananas in the Upper Richmond area of New South Wales has now been lifted, a permit for the movement or planting of any suckers must be obtained from the local inspector of the Department of Agriculture. The district is now in a very satisfactory position as

regards bunchy top [*R.A.M.*, xvii, p. 760], which it is hoped to maintain, with the co-operation of growers, without resorting to the reimposition of quarantine regulations.

McLachlan (T.) & Floren (J.). **Some aspects of mould growth.**—*J. Oil Col. Chem. Ass.*, xxii, 229, pp. 180–188, 1 pl., 1939.

In experiments made to investigate the growth of moulds on building materials coated with water paints and to find a suitable antiseptic to add to such paints [cf. *R.A.M.*, xviii, p. 333] plaster blocks were prepared, sterilized, treated with malt extract, inoculated with moulds [unspecified] from mouldy water paint, incubated, and coated with water paints containing antiseptics. The evidence indicated that mould growth on paint may be retarded if the under surface to which the paint is to be applied is dry, or is treated with a strong and not readily soluble fungicide, or if fungicides are added to the paint. Mould resistance in paints should be studied primarily to secure moisture-resistant, plastic films not providing food for mould growth.

Doherty (E. E.). **Pink discoloration of white chrome leather by microorganisms.**—*J. Leath. Chem. Ass.*, xxxiv, 8, pp. 464–467, 1939.

A red yeast, identified on the basis of its cultural and biochemical characters as *Torula mucilaginosa* (*T.* [*Rhodotorula*] *glutinis*) [*R.A.M.*, xviii, p. 774], was isolated at the Cincinnati Institute of Scientific Research from pink spots, 0·2 to 2 cm. in diameter, on white chrome leather. Among other fungi isolated from one lot of white finishing materials were *Neurospora sitophila* [ibid., xvii, p. 558] and a *Fusarium*, both of which produced a salmon-red coloration on artificial media. The addition of the sodium salt of pentachlor phenol to the pickled stock at the rate of 9 lb. per 5,000 lb. gave satisfactory results in tannery practice.

Leischner-Siska (Elfriede). **Zur Soziologie und Ökologie der höheren Pilze. Untersuchung der Pilzvegetation in der Umgebung von Salzburg während des Maximalaspektes 1937.** [On the sociology and ecology of the higher fungi. Investigation of the fungal flora in the environs of Salzburg during the period of maximum occurrence in 1937.]—*Beih. bot. Zbl.*, lix, 2–3, pp. 359–429, 1 graph, 1939.

In this paper on the ecology and the sociologic associations of higher fungi tabulated data are given on 229 species found during 1937 in 22 beech and five conifer stations in the vicinity of Salzburg [Ostmark, Germany].

Porter (R. H.). **Detection and classification of seed-borne organisms, their effect on germination and their control by seed disinfection in laboratory and field.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1938*, pp. 195–213, 1939. [Mimeographed.]

In this paper the author briefly describes the results obtained at the Iowa State College Seed Laboratory with certain phytopathological techniques employed in laboratory practice to determine the pathological condition of seeds. In this connexion he discusses the various

methods in general use for classifying organisms and disease-producing entities carried by seeds and vegetative reproductive organs on a systematic basis, relation to the host (systemic or non-systemic), mode of dissemination, relation to development of disease, parasitism, and effect on seed viability. The second part of the paper discusses the detection, by symptoms, of organisms and other disease-producing entities on germinating and non-germinating seeds. The methods used at Iowa for this purpose are briefly outlined. They consist in washing the seeds in sterile water, with or without centrifuging, followed by examination of the water for the presence of spores, examination of fruiting bodies on the surface of seeds and glumes of grass fruits, macroscopic examination of seed lots for sclerotia and masses of fungi, plating seeds in agar, germinating seeds on moist blotters, growing seedlings in soil or sand in the laboratory (a valuable method), growing plants in greenhouse pots, benches, and flats, and lastly, field tests for the appearance of diseases caused by seed-borne organisms. It is pointed out that when optimum conditions for seed germination and growth differ from those required by the pathogen, two tests may be necessary, one to determine the maximum viability of the seed, and another to detect the presence of and indicate the injury caused by the pathogen. In the third and final section of the paper the author discusses the classification of seed disinfectants on a basis of physical state and stability, depth of penetration, residual effect, and toxicity, and briefly describes different purposes for which they are used, their methods of application, and their effect on seed germination in the laboratory and the field.

[An account of the methods used for the phytopathological examination of seeds in Iowa is also given in *Chron. bot.*, v, 4–6, pp. 442–444, 1939.]

WENZL (H.). **Die Untersuchung epiphytischer Pilze nach dem Abdruckverfahren (Zelloidinhäutchen-Methode).** [The examination of epiphytic fungi by the 'film' process (celloidin membrane method).]—*Zbl. Bakt.*, Abt. 2, c, 14–17, pp. 327–342, 5 figs., 1939.

The writer has obtained very satisfactory results at the Vienna Plant Protection Institute by the use of the following technique for the examination of epiphytic fungi, especially such groups as the mildews, Mucedineae, and Dematiaeae. Solutions of celloidin (5 to 5·5 per cent.) dissolved in alcohol-ether (1:2), with the addition of 40 per cent. *Ricinus* oil for softening where indicated, gelatine (17 to 20 per cent. in water), or gum arabic (35 per cent. in water+30 per cent. glycerine) are smeared or painted on the infected surface by means of a glass rod or paint brush (preferably the former), allowed to dry for ½ to 1½ hours, and the films then peeled off. Other useful compounds tested were ethyl cellulose and oxyethylpropylcellulose. Before examination gelatine films are allowed to swell in water, gum arabic in glycerine (60 per cent.), and celloidin in alcohol (96 per cent.). For permanent mounts of the water-soluble gelatine and gum arabic films dilute glycerine (two parts to one of water) is recommended (after dipping the film in alcohol), while for those of the other preparations concentrated glycerine is more suitable.

Effect of sulphur dioxide on vegetation.—447 pp., 48 pl. (2 col.), 5 figs., 54 graphs (1 col.), 3 maps, Ottawa, National Research Council of Canada, 1939. $15.

This book consists of fifteen papers by different authors describing various aspects of investigations carried out almost continuously for over eight years in North America into the effect of sulphur dioxide on vegetation, the inquiry resulting from complaints by farmers of northern Stevens County, Washington, that fumes from the Trail smelter, in the Columbia River valley, British Columbia, were damaging their crops and forests. A considerable reduction in the quantity of sulphur dioxide given off has been effected and the concentration of the gas near the plant has been reduced from a maximum of 1·3 p.p.m. (April, 1933) to a maximum during 1937 of 0·48 p.p.m.

The evidence showed that accurate diagnosis of the distribution and intensity of sulphur dioxide symptoms on leaves of plants is difficult unless data are obtained as to the character and intensity of the sulphur dioxide visitations, the meteorological conditions, the sulphur content of the affected plants, and the reaction of indicator plants. Markings resembling those due to sulphur dioxide may be attributable to winter injury, drought, insects, fungi, or physiological troubles.

Acute symptoms of sulphur dioxide injury to crop plants are seldom present when rainfall is deficient. The most susceptible crops include lucerne, barley, rye, wheat, and oats.

Symptoms of acute injury on conifers consist in a reddish discoloration of the leaves involving the entire length of the leaf or a small area at the base, middle, or tip, subsequent shrinkage of tissue, and defoliation. Frequent repetition of such injury induces the fall of the older leaves. If the gas concentration is weaker chronic injury results, consisting in partial destruction of chlorophyll with resultant chlorosis. Transplanted conifers in irrigated plots were more susceptible to injury than similar species growing under natural conditions.

In cereals the symptoms of acute injury consist in somewhat flaccid, greyish-green areas, which rapidly dry up in the presence of sunlight, the cell contents shrinking and the leaf becoming bleached after decomposition of the chlorophyll. Chlorotic, as distinct from acute, injury in cereals causes a temporary or permanent loss of the normal green colour of the chlorophyll; in the temporary type of injury the leaves do not lose their turgor, and the affected plants may recover.

A study of the influence of concentrations of sulphur dioxide from 0·1 to 5·8 p.p.m. on the stomatal movement of lucerne leaves demonstrated that with the highest concentrations partial or total stomatal closure ensued a few minutes after application of the gas. With decreasing concentration this effect gradually disappeared.

No evidence was found that in the absence of leaf injury sulphur dioxide exerts an invisible effect detrimental to the yield and growth of crops. Experiments on lucerne showed that in the absence of visible symptoms sulphur dioxide began to exert a measurable effect on photosynthesis when the concentration was about 0·4 to 0·5 p.p.m., carbon dioxide assimilation rapidly returning to normal after removal of the gas. Short treatments in daylight with high concentrations not causing appreciable leaf injury increased subsequent night respiration.

Cottam (C.). **The Eelgrass situation on the American Pacific coast.**—*Rhodora*, xli, 487, pp. 257–260, 1939.

The author reports there is no authentic data indicating any reduction of eelgrass (*Zostera marina*) along the Pacific coast of North America: although *Labyrinthula* [*macrocystis*] has been identified from eelgrass in Departure Bay, British Columbia [*R.A.M.*, xvii, p. 543], the beds there continue to make good growth. In September, 1938, Dr. Borgesen reported that the eelgrass along the Danish coast was recovering [ibid., xv, p. 671]. Some improvement has occurred since February, 1938, off eastern Maine, and A. D. Cotton reported in August, 1938, that he believed the situation was easier in English waters [ibid., xviii, p. 334].

Stevens (N.). **Environmental factors and the wasting disease of Eelgrass.**—*Rhodora*, xli, 487, pp. 260–262, 1939.

With reference to Tutin's view that the disappearance of eelgrass (*Zostera marina*) from English waters [see preceding abstract], was due to deficient sunshine, the author considers that the available data from the American Atlantic coast do not support this hypothesis. As no report of the disease has been received from the Mediterranean, where the salinity of the surface waters is 37 to 39 per mille, the effect of salinity on the parasite (*Labyrinthula*) [*macrocystis*] might advantageously be studied in this locality.

Hamada (M.). **Studien über die Mykorrhiza von Galeola septentrionalis Reichb. f. Ein neuer Fall der Mykorrhiza-Bildung durch intraradicale Rhizomorpha.** [Studies on the mycorrhiza of *Galeola septentrionalis* Reichb. f. A new case of mycorrhiza formation by intraradical rhizomorphs.]—*Jap. J. Bot.*, x, 1–2, pp. 151–211, 2 pl., 15 figs., 1 diag., 9 graphs, 1939.

The following are among the reasons adduced for the relatively immense size attained by the orchid *Galeola septentrionalis* [cf. *R.A.M.*, xi, p. 317; xviii, p. 801] in the Kyoto district of Japan, where the roots and rhizomes of the plants may occupy an area of 1 are. The fungal symbiont, identified as *Armillaria mellea* on the basis of comparative culture with known strains although the fruit bodies have not been produced, provides an abundance of raw nutrient materials, which it actively dissolves and conveys directly to the root tissues by means of subterranean and subcortical rhizomorphs. The root system of the host (up to 5 m. in length) is further possessed of an extensive digestive and storage tissue so that the metabolic processes function with extreme regularity. The outer cortex is resorbed by the rhizomorphs, some of which are also extruded from the intraradical rhizomorph complex in search of fresh food supplies.

Kusano has shown that *A. mellea* is likewise the fungal symbiont of *Gastrodia elata* (*J. Coll. Agric. Tokyo*, iv, 1911), on which, however, it does not form intraradical rhizomorphs or possess a well-developed digestive tissue, with the result that the modes of ingestion differ completely in the two hosts.

In *Galeola septentrionalis* the symbiont invades the cortex during the summer and autumn, and ingestion proceeds through the winter and

until the following summer, *A. mellea* gaining the upper hand at a time when its optimum soil temperature of 25° C. prevails and the host being active under the more congenial conditions of the colder months. The reactions of the host to its invader include lignification and 'Röhrentüpfel' formation of the outer cortical and epidermal cells as well as nuclear deformation of the cortical cells. As with many other orchids, the process of ingestion of the fungal coils is preceded by a turning-point at which the hydrogen-ion concentration of the hyphal clumps reaches a maximum of P_H 6·2. Of the reserve food substances, starch and oil increase in the root system during the active, and albumin during the inactive, period.

RAYNER (M. C[HEVELEY]). **The mycorrhizal habit in relation to forestry. III. Organic composts and the growth of young trees.**—*Forestry*, xiii, 1, pp. 19–35, 4 pl., 3 graphs, 1939.

In further studies on growth responses of young conifers to the addition of certain organic composts to soil [*R.A.M.*, xv, 737], the method of comparative pot cultures with transported soil was used. In two series one of two kinds of compost was added to the soil at sowing time and in two others salts were added estimated to supply equivalent values of nitrogen, potash, phosphoric acid, and lime to those in the composts. One set of each duplicate series had the drainage water returned to the pots, whilst in the other this was not done.

At the end of the first year's growth seedlings of Scots pine [*Pinus sylvestris*] grown in soil receiving compost exhibited better growth than those receiving equivalent soluble salts, and this difference became still more marked during the second season. The fact that the addition of soluble salts evoked surprisingly little response in pine seedlings as compared with responses to composts confirms the author's previous conclusions that the use of organic composts produces qualitative changes in the humus constituents and that these, rather than the increase in the supply of available nutrients, are the fundamental cause of restored fertility. On the whole, plants with drainage not returned were slightly better (possibly excepting those receiving composts) than those with drainage returned, but the difference was very small. From the dry weights, however, it became evident that when the return of drainage water increased the dry weight this increase affected mainly the roots, whereas when the return of drainage water decreased the dry weight this decrease affected mainly the shoot system. Return of the drainage water was unfavourable in all cases except where composts were added.

The results of these experiments confirm the conclusion already reached that deleterious substances exist in the soil solution and show further that the addition of mineral salts is practically without effect on the production of such substances, whereas that of composts stops their formation. The strikingly beneficial effect of the composts on the growth of conifers is believed to be closely bound up with the mycorrhizal habit and its reaction on nutrition, and it is pointed out in support of this view that in the above-described experiments all plants showing maximum size, health, and vigour displayed a corresponding development of mycorrhiza.

Romell (L. G.). **Barrskogens marksvampar och deras roll i skogens liv.** [The soil fungi of the conifer forest and their rôle in its life.]—*Svenska SkogvFören. Tidskr.*, iii, 37, pp. 349–375, 1 fig., 1939. [English summary.]

Some of the information contained in this critical review of the available knowledge of the mycoflora of conifer forests, with special reference to the mycorrhizal problem in Sweden, has already been noticed from other sources [*R.A.M.*, xiv, p. 602; xviii, p. 541], but the following additional points are of interest. P. Larsen (*Friesia*, i, pp. 157–193, 1934) calculated in west Jutland, Denmark, that an annual crop of the fruiting bodies of only one species of large mycorrhizal Hymenomycetes amounted to some 180 kg. dry weight per hect. and contained 5 kg. nitrogen per hect.

Proof of the hypothesis that facultative mycorrhiza exist in addition to the obligate species is considered to be supplied by the appearance of *Boletus tomentosus* in experimental trenched plots containing neither tree roots nor other mycorrhiza.

Two effects of mycorrhizal formation must be distinguished—one physiological, involving the transformation of uninfected roots into more efficient organs of absorption, and the other ecological, entailing the substitution of mycorrhiza for pseudomycorrhiza, which develop in nature in the absence of mycorrhiza but are poor organs of absorption, inferior to the uninfected roots. The author does not accept Rayner's explanation of the activity of composts in promoting pine growth and mycorrhizal formation in a poor heath soil [see preceding abstract]. The simplest interpretation of her results is that the addition of compost counteracts the lack of available nutrients, which precludes both host and mycorrhizal growth in the unfertilized soil.

Thom (C.) & Steinberg (R. A.). **The chemical induction of genetic changes in fungi.**—*Proc. nat. Acad. Sci., Wash.*, xxv, 7, pp. 329–335, 1939.

By culturing stable strains of *Aspergillus niger* and *A. amstelodami* [*R.A.M.*, xiv, p. 671] in a mannitol-sodium nitrite solution [the composition of which is given] the authors were able to obtain consistent variation under nitrite stimulation. The changes in morphology observed in *A. niger* included increased vegetative mycelium, increased production of yellow to orange colour in the hyphae, reduction in the conidia-producing apparatus in the form of diminutive stalks, reduced size of heads, elimination or reduction of the primary sterigmata, great reduction in the numbers of spore-producing cells, and the production of comparatively few spores. With *A. amstelodami* the changes noted were as follows. Few perithecia were produced and were differently placed, the green conidial phase was increased, as was the vegetative mycelium, reduction beginning with the complex form of fruiting and accentuating the simpler.

The results seem to offer a clue to the origin of groups of strains capable of remaining taxonomically stable for long periods in standard culture media, but in which spore characters are almost identical. Further work may provide means of interpreting other groups and of producing variations possessing useful biochemical activity.

KATSER (ANNIE). **Besitzt Botrytis vulgaris antagonistische Eigenschaften gegenüber Phytophthora Arten und kann sie zur biologischen Bekämpfung derselben herangezogen werden?** [Is *Botrytis vulgaris* antagonistic to species of *Phytophthora* and can it be used for their biological control?]—*Boll. Staz. Pat. veg., Roma*, N.S., xix, 1, pp. 75–86, 6 figs., 1939. [Italian summary.]

In the course of the author's recent studies on fungi antagonistic to *Phytophthora* [*R.A.M.*, xviii, p. 486], *Botrytis vulgaris* [*B. cinerea*] was seen to suppress the growth of *Phytophthora* even more rapidly than *Trichoderma*. In experiments undertaken with the object of investigating this relationship *B. cinerea* was found to be strongly antagonistic to *P. citrophthora*, *P. megasperma*, *P. cambivora*, and *P. parasitica*, but filtrates from cultures of *B. cinerea* were considerably less injurious to *P. citrophthora* than the fungus itself. No evidence of antagonism was manifest in mixed inoculations with *P. parasitica* and *B. cinerea* on tomatoes and combined soil inoculations were inconclusive. It is concluded that *B. cinerea* is of no practical value for the biological control of *P. parasitica* on tomato.

VAN LUIJK (A.). **Antagonisme tusschen microorganismen.** [Antagonism between micro-organisms.]—*Vakbl. Biol.*, xx, 10, pp. 177–188, 1939.

This is a critical survey of some recent important contributions [most of which have been noticed in this *Review*] to the knowledge of mutual antagonism between fungi.

COCKERHAM (G.). **A comparison of the metabolism of mosaic diseased Potatoes with that of normal Potatoes.**—*Ann. appl. Biol.*, xxvi, 3, pp. 417–439, 8 graphs, 1939.

Studies in Scotland on the carbohydrate and nitrogen metabolism of the leaves and petioles of healthy President and Arran Victory potato plants and others of the same varieties infected with potato virus X [*R.A.M.*, xiv, p. 52; xv, p. 523] showed that while comparisons between carbohydrate variations over diurnal and seasonal periods establish a similarity in the gross metabolism of carbohydrates in normal and mosaic leaves, definite, if slight, modifications of the fundamental metabolism may arise as a result of mosaic infection. At every stage of the diurnal investigations the diseased laminae had lower starch values than the healthy ones. Slight differences in carbohydrate variations consistently indicated impediment in starch formation and hydrolysis in the affected leaves. There was also evidence of interference with the utilization of sugars in the early growth stages, when the affected leaves were actively engaged in tissue synthesis. This change in metabolism merely preceded, however, a similar change in healthy leaves, and subsequently the only differences between the diseased and healthy leaves in this respect were in the slightly reduced amounts of carbohydrate and a persistent interference with starch elaboration in the mosaic leaves.

The slight disturbances observed in diurnal carbohydrate metabolism in the mosaic leaves would appear to be due to two possible causes:

(*a*) pathological changes brought about by the virus in the mottled areas; (*b*) disturbances affecting primarily the growth activities of the diseased plant leading to a diminished demand for carbohydrates required for growth. A significantly larger nitrogen content was found in diseased leaves at all stages of growth and it is possible that the pathological symptoms and retarded growth activities, which give rise to disturbances in carbohydrate metabolism, may result directly from a disorganized nitrogen metabolism.

WALKER (J. C.) & LARSON (R. H.). **Yellow dwarf of Potato in Wisconsin.**—*J. agric. Res.*, lix, 4, pp. 259–280, 5 figs., 1 map, 1939.

In studies carried out in Wisconsin from 1933 to 1938, inclusive, on potato yellow dwarf [*R.A.M.*, xviii, p. 540] it was found that an important symptom not previously recorded is the non-emergence of plants from infected seed tubers. The top symptoms were shown to develop most rapidly and severely at high air temperatures and at 16° C. they may be completely suppressed. Low soil temperatures favour the germination of infected seed and the emergence of shoots but tend to suppress the appearance of top symptoms, whereas high soil temperatures tend to prevent emergence and enhance the expression of top symptoms. The 'poor-stand' phase of the disease in Wisconsin is associated with high soil temperatures, the majority of the crop being planted late.

The destructiveness of the disease locally has varied greatly from year to year. In a cool season the evidence of current-season spread may be entirely masked and the difficulty of maintaining healthy seed stocks in some areas is correspondingly great. Confirmatory evidence was obtained that the clover leafhopper (*Aceratagallia sanguinolenta*) [loc. cit.] is a vector of the disease and in 1937 a close correlation of seasonal spread of the virus with abundant infestation with this insect was established. No field evidence was obtained of spread by the potato leafhopper (*Empoasca fabae*) or aphids, and no correlation was found between yellow dwarf epidemics and red clover (*Trifolium pratense*) plantings, other sources of inoculum being evidently more important in central Wisconsin. During the 1937 epidemic the Russet Burbank variety tended to escape infection, though 18 other potato varieties and strains in the vicinity were heavily attacked.

DECKER (P.). **A new Potato disease in New York.**—*Plant Dis. Reptr*, xxiii, 14, pp. 226–227, 1939. [Mimeographed.]

A disease of potatoes, agreeing very closely with 'blue stem' [*R.A.M.*, xviii, p. 53] and also with 'purple top wilt' [ibid., xvii, p. 700] and believed to be a form of western aster yellows [ibid., xvi, p. 797], was observed in an early planting of Warba and Cobbler varieties on a farm near Boston, New York State, the symptoms being present on approximately 15 per cent. of the former and 2 per cent. of the latter variety. All varieties of potatoes are susceptible to the disease, the reduction in yield depending largely upon the stage of development of the potato plant at the time of infection. Reports from West Virginia state that in 1935 one field showed nearly 100 per cent. severely infected plants and yielded only 10 bush. of U.S. No. 1 tubers per acre, and that

similar cases have occurred in each succeeding year. The disease is not transmitted by the tubers but is carried over from year to year in weed hosts. The aster leafhopper [*Cicadula sexnotata*], a vector of the virus, was present on many different plants.

REDDICK (D.). **Whence came Phytophthora infestans?**—*Chron. bot.*, v, 4–6, pp. 410–412, 1939.

The author discusses the possible origin of potato blight (*Phytophthora infestans*) [*R.A.M.*, xviii, p. 544], first observed in North America in 1842, and advances the view that the original introduction of the parasite to potato fields in this region or to any region of the Old World was possibly by means of oospores from some Solanaceous plants introduced for ornamental or pharmaceutical purposes. The assumption that *P. infestans* is enphytotic in the higher Andes of South America is believed to be false, for (1) no sample of potato from this region has even been found to show resistance to the disease; (2) the fungus has not been found on herbarium specimens collected before 1850; and (3) it is only prevalent in Peru and Chile where European potatoes are grown. On the other hand, the parasite is probably enphytotic in Mexico for (1) cultivated potatoes are rare in this country; (2) the fungus occurs on wild native species; and (3) most of the species are resistant or immune. It is suggested, therefore, that more intensive studies should be undertaken on the behaviour of the parasite on Mexican Solanaceous plants rather than those of South America.

CAIRNS (H.) & MUSKETT (A. E.). **Phytophthora erythroseptica Pethybr. in relation to its environment.**—*Ann. appl. Biol.*, xxvi, 3, pp. 470–480, 2 graphs, 1939.

In studies carried out in Belfast on the potato pink rot organism *Phytophthora erythroseptica* [*R.A.M.*, xiii, p. 180; xviii, p. 135], the effect of staling on the growth rate on natural media was negligible. On some synthetic media, however, notably where potassium nitrate served as a source of nitrogen growth ceased about 1 cm. from the edge of the Petri dish. Daylight exercised no appreciable effect on the growth or reproduction of the fungus. Growth occurred over a wide range of hydrogen-ion concentrations (P_H 3·2 to 9 or 10), the optimum being P_H 6·0 to 7·0. Oospores developed freely over most of the P_H growth range, but not near the limits of acidity or alkalinity. Sporangia were not produced on the gel media used.

On oat, potato, and malt extract agars the minimum, optimum, and maximum temperatures for growth were, respectively, 5°, 25°, and 31° C. Direct infection of the tubers seldom occurred below 10° or above 30°, the optimum for infection and development of the disease being about 20° to 25°.

Referring to the form of pink rot (known to farmers as 'waterslain' or 'drowning') due to simple asphyxiation by flooding, the authors show that under aseptic conditions in the laboratory, death of the tubers, or the lowering of their resistance to a point where they readily become invaded by putrefactive organisms, occurred after submergence in water for at least 24 hours at 16° to 20°. Tuber decline in these conditions was accompanied by symptoms resembling pink rot due to parasitic causes. In so far as *P. erythroseptica* is responsible for pink

rot, excessive soil moisture is also conducive to the disease, in which case infection may readily take place by way of the 'eye'. With low soil moisture infection in contaminated soil is inhibited and with normal moisture occurs through the 'heel' of the tuber via the dead or moribund stolon. 'Eye' infections may be due to zoospores.

The results obtained show that attempts to control the disease by modifying the soil acidity are impracticable. Lime as a soil flocculant, by improving drainage, should, however, tend to limit the incidence of infection.

GREEVES (T. N.) & MUSKETT (A. E.). **Skin spot (Oospora pustulans Owen & Wakef.) of the Potato, and its control by tuber disinfection.**—*Ann. appl. Biol.*, xxvi, 3, pp. 481–496, 1 pl., 1939.

In experiments carried out in Belfast from 1933 to 1938 on the control of potato skin spot (*Oospora pustulans*) [*R.A.M.*, xviii, p. 412] by seed tuber disinfection, the best results were given by instantaneous dipping (from $\frac{1}{2}$ to 1 min.) in three proprietary organo-mercury compounds (A, B, and C), especially organo-mercurial C. Steeping for 90 minutes in a 0·1 per cent. solution of mercuric chloride was also effective, but unduly tedious.

Disinfection at digging was considerably more effective than immediately before planting, and when a period of more than eight weeks was allowed to elapse between digging and disinfection the value of the treatment was substantially diminished. In one year's experiments early digging did not reduce the amount of infection which developed during subsequent storage. Disinfection at each of the five diggings gave satisfactory control.

As disinfection of seed tubers at digging has also given good results against *Actinomyces scabies* [ibid., xvi, p. 273] and *Phytophthora infestans* [ibid., xvi, p. 488], it would appear that this treatment may prove effective against a group of seed tuber diseases, many of which are transmissible to the subsequent crop.

DE BRUYN (HELENA L. G.). **Onderzoekingen over enkele Actinomyceten, welke Aardappelschurft verwekken.** [Studies on some Actinomycetes responsible for Potato scab.]—*Tijdschr. PlZiekt.*, xlv, 4, pp. 133–156, 3 pl., 1939. [English summary.]

Some of the information in this study on potato scab (*Actinomyces scabies* and other *A.* spp.) at the Wageningen (Holland) Mycological Laboratory [*R.A.M.*, xv, p. 250] has already been noticed from various sources. The different types of the disease are distinguished, and in this connexion the results of soil inoculation experiments with pure cultures of the fungi on sterilized green rye or grass are reported to have confirmed the previous conclusion of the writer and others that the deep and superficial (russet) forms of infection are due to two separate strains. Further evidence of the dissimilarity of the strains responsible for the different scab types was afforded by the varying reactions of the varieties used in the experiments. For instance, a strain causing russet of Bintje and Industrie was non-pathogenic to Eigenheimer, Jubel, Alpha, Thorbecke, and Roode Star. Again, strain 3a, the agent of a virulent deep scab on Bintje, similarly affected

Industrie, Eigenheimer, Thorbecke, and Roode Star, whereas on Jubel the lesions were very shallow and Alpha developed a type partaking both of the russet and common characteristics, predominantly the former. In other tests all russet-forming strains severely attacked Bintje while sparing Eigenheimer, which was badly injured, on the other hand, by strains of the deep type.

In respect of retention of virulence the experimental strains varied considerably. Strain 5, for example, isolated in 1933, did not begin to decline until after $1\frac{1}{2}$ years in pure culture; reisolation in 1935 produced a renewal of pathogenicity, which again gradually decreased. Of a number of strains investigated in 1937–8, B_2 was the only one acquiring an increase of virulence in pure culture; two strains remained constant, while eight others underwent a decrease of pathogenicity, which was restored to varying degrees by reisolation. No restorative effect was produced by the culture of weakened strains on sterile sections of living potato or carrot, indicating that the special substances inducing virulence are present only in the actively growing potato tuber cells.

Discussing the problem of control, the author advocates increased attention to rotation, not only of unrelated crops but also of different potato varieties, the negative reaction of some of which to certain strains of the fungus, as shown above, may be equivalent to the entire omission of potatoes from the scheme. Ferric chloride was the only one of various chemicals tested to give effective control of scab; applied at rates in excess of 10 gm. per pot, however, it caused considerable injury to the plants, and its use in the field is regarded as impracticable.

DORST (J. C.). **Schurftaantasting bij nakomelingen van verschillende Aardappelkruisingen.** [Scab infection among the progeny of various Potato crosses.]—*Tijdschr. PlZiekt.*, xlv, 4, pp. 157–161, 1 graph, 1939.

The reaction to scab (*Actinomyces scabies*) [see preceding abstract] in the breeding field of the Friesian Agricultural Society (Holland) among the progeny of four potato crosses [ibid., xviii, p. 200], viz., K131 × Groene Furore, Iris × Furore, Bravo × Alpha, and Dunbar Yeoman × Geeltje was computed arithmetically and estimated by groups in relation to the quasi-immune Alpha (1) and the very susceptible Ideaal (9). Of the K 131 × Groene Furore cross, 9 out of 19 plants fell into group 1, and 3, 5, and 2 into groups 2, 3, and 4, respectively, thus providing very satisfactory breeding material. The Iris × Furore cross also yielded a fair proportion of sound offspring, 9 out of 44 being placed in group 1, 15 in 2, 8 in 3, and 5, 4, 2, and 1, in groups 4, 5, 6, and 8, respectively. On the other hand, the resistance of the Bravo × Alpha and Dunbar Yeoman × Geeltje crosses was decidedly poor, only 1 of each falling into group 1 out of 18 and 21, respectively.

AYERS (G. W.) & HURST (R. R.). **Verticillium wilt of Potatoes in Prince Edward Island.**—*Sci. Agric.*, xix, 12, pp. 722–735, 4 figs., 1 graph, 1939.

Since 1937 wilt disease of potatoes (*Verticillium albo-atrum*) [*R.A.M.*, xvii, p. 700] has been recognized as a problem of importance in the Prince and Queen's Counties of Prince Edward Island, Irish Cobbler

being the variety most subject to it. The seed potato inspection service has found it extremely difficult to obtain accurate field estimates of this disease, as wilt symptoms vary in the time of their appearance and severity from year to year, and even from day to day, according to climatic conditions. Generally wilt symptoms are more pronounced in extremely dry years, while under moist conditions they are not easily observed; on hot, sunny days the wilted plants will display a noticeable flagging, while on a cool, overcast day they often recover. Attacks of early or late blight [*Phytophthora infestans* and *Alternaria solani*] may, furthermore, totally mask any wilt present.

It has been observed that wilt attacks become evident after the first week in August in each year, the percentage of infection increasing as the season advances. Growth of the fungus in culture was good over a wide range of temperatures (60° to 77° F.) but the maximum and optimum were 30° to 32°, and 19° to 21° C., respectively. In most cases where major epidemics of wilt have occurred in the field, the origin of infection could be traced back to a diseased stock of the previous year. It was found that both eye- and stem-end sets of diseased tubers are liable to produce wilted plants.

The chief economic effect of wilt lies in reduced yields of marketable tubers. The results of field tests seemed to indicate that infection taking place in the field has no immediate effect on the yield, but when tubers from diseased plants were used for seed considerable reduction in yield followed. A plot with approximately 60 per cent. wilt showed 35 per cent. reduction in marketable tubers compared with that from certified seed, the total production being reduced by approximately 30 per cent. Control measures advocated at present consist in (1) the use of disease-free seed, (2) roguing of diseased plants and those immediately adjacent, and (3) the practice of a long rotation where the disease has been encountered.

MARTIN (A. L.). **Rice straw stacks as a source of infection with the black kernel disease.**—*Plant Dis. Reptr*, xxiii, 14, pp. 247–249, 1939. [Mimeographed.]

Cultures made from dust blown from rice straw stacks, used as forage for cattle in Texas, during the spring and summer of 1939 showed the presence of several species of fungi, colonies of *Curvularia lunata* being more numerous in those cases where the previous crop had been infected with black kernel disease, tentatively attributed to this fungus [*R.A.M.*, xviii, p. 545]. It would thus appear probable that *C. lunata* is capable of overwintering in the straw stacks and new infection may result from spores blown to the flowering plants in the next season. Dry weather and high winds during the flowering period may increase the amount of infection.

RYKER (T. C.). **Leaf blotch, a new disease of Rice and certain native plants in Louisiana.**—Abs. in *Phytopathology*, xxix, 8, pp. 749–750, 1939.

In July, 1936, rice plants near Crowley, Louisiana, developed a disease of the leaves and leaf sheaths characterized by large, irregular, bleached, reddish-tinted and -bordered, coalescent lesions, destroying

a large portion of the foliar tissue, and in some instances by small, scattered, circular spots. Similar symptoms were observed on a number of weeds, including *Caperonia castaneaefolia*, *Axonopus furcatus* [*Paspalum furcatum*], *Echinochloa crus-galli*, and *P.* spp., and have since been noted on rice and *Cynodon dactylon* in the south-west Prairie, on *A. compressus* [*P. compressum*] in Texas, and on *Carex frankii* near Baton Rouge, Louisiana. The sterile fungus isolated from diseased material grows with extreme rapidity, producing in and on the medium thin, greyish-brown, stromatic crusts suggestive of a species of *Ciboria* or a related genus. The symptoms have been induced on rice by introducing fragments of mycelium into the leaf and leaf sheath tissues.

Cronshey (J. F. H.) & Barclay (C.). **Replanting in areas infested by root disease. Preliminary results obtained from an experiment on low land on Sumatra's east coast.**—*Arch. Rubbercult. Ned.-Ind.*, xxiii, 3, pp. 163–172, 1939. [Dutch summary.]

In experimental plots on the Serbangan estate, east coast of Sumatra, the use of *Pueraria javanica* as a cover crop after felling for rubber [*Hevea brasiliensis*] reduced the losses from white root rot (*Fomes lignosus*) [*R.A.M.*, xviii, p. 728] from 1936 to 1938 by an average of 60 per cent., the damage in these plots being only two-fifths of that recorded in the clean-weeded series; the growth of the trees, however, was less vigorous. Stump-pulling instead of felling, entailing the eradication of the root-collars, parts of the tap-roots, and large side roots, and digging with a short-handled grub-hoe, produced little effect singly, but when applied jointly (clean-clearing) these methods reduced the root rot losses by slightly under half. The maximum benefit from the digging of plant holes, bringing the losses down by about a quarter, was experienced during the first year. Taken collectively, all the cultural practices under discussion have diminished the losses due to white root rot and similar diseases to about a seventh of their incidence in the absence of any treatment, i.e., from 55 trees per acre (18 per cent.) to 7·4 (2·5 per cent.). It is suggested that the best treatment would be to establish a cover and to weed near the trees.

Gehlsen (C. A.). **Die Rindenbräune von Hevea brasiliensis.** [Brown bast of *Hevea brasiliensis*.]—*Tropenpflanzer*, xlii, 8, pp. 323–329, 1939.

This is a summary, based on a perusal of the relevant literature, of the available knowledge concerning brown bast of *Hevea* rubber [*R.A.M.*, xvii, p. 414].

Krya [? Kiryu] (T.). **Studies on the physiological characters of Ceratostomella paradoxa.**—*Rep. Govt Sug. Exp. Sta., Tainan*, 6, pp. 21–37, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 10, p. 33, 1939.]

Potato sucrose agar proved to be the best of the media tested for the mycelial and conidial growth of *Ceratostomella paradoxa*, the agent of pineapple disease of sugar-cane [*R.A.M.*, xvi, p. 774; xviii, pp. 625, 626], which is stated to be ubiquitous in Formosa. Development took place at a temperature range of 13° to 34° C., with an optimum at 25° to 31°, and at hydrogen-ion concentrations between P_H 1·7 and

11, the optimum being 5·5 to 6·3. Growth is made on substrata containing up to 30 per cent. sucrose, but is most vigorous at 3 per cent., the addition of 0·3 to 0·5 per cent. common salt exerting a further stimulus.

LITSCHAUER (V.). **Ein Beitrag zur Kenntnis der Basidiomyceten der Umgebung des Lunzer Sees in Niederdonau.** [A contribution to the knowledge of Basidiomycetes in the environs of the Lake of Lunz in the Lower Danube Valley.]—*Öst. bot. Z.*, lxxxviii, 2, pp. 104–147, 6 figs., 1939.

This is an annotated list of 269 fungi, including a number of Polyporaceae, collected in 1930 in the environs of the Lake of Lunz, Lower Danube, Austria.

HIRATSUKA (N.). **Miscellaneous notes on the East Asiatic Uredinales with special reference to the Japanese species (V).**—*Jap. J. Bot.*, xv, 7, pp. 433–439, 1939.

This further instalment of the author's critically annotated list of Uredinales from eastern Asia (chiefly Japan) [*R.A.M.*, xviii, p. 204] includes *Uromyces ervi* (syn. *U. fabae*) [ibid., xvi, p. 207; xviii, pp. 204, 553, 567] on vetch (*Vicia sativa*), recorded for the first time from China, and *Nyssopsora cedrelae* on *Cedrela sinensis* in Japan.

SOONG (T. F.). **Beitrag zur Cytologie der Uredinee Ochropsora sorbi Diet.** [A contribution to the cytology of the Uredine *Ochropsora sorbi* Diet.]—*Flora, Jena*, N.F., xxxiii, 4, pp. 345–364, 15 figs., 1939.

The results of an intensive cytological study at Marburg University, Germany, of *Ochropsora sorbi* on *Pyrus aucuparia* and *Anemone nemorosa* are described in detail.

BALDACCI (E.). **Introduzione allo studio degli Attinomiceti.** [An introduction to the study of the Actinomycetes.]—*Mycopathologia*, ii, 2, pp. 84–106, 3 pl., 1939. [English summary.]

In this paper the author sums up and critically discusses the present state of knowledge concerning the Actinomycetes, with special reference to the systematic position of these fungi [*R.A.M.*, xviii, p. 626].

SIMURA (T.). **Studies on the resistance to brown blight in Tea plants.**—*Jap. J. Genet.*, xiv, pp. 243–247, 1939. [Japanese. Abs. in *Plant Breed. Abstr.*, ix, 4, p. 455, 1939.]

Analyses of a number of tea varieties with strong, moderate, or weak resistance to brown blight (*Guignardia camelliae*) [*R.A.M.*, xvii, p. 71] indicated that the chemical composition of the leaf tissue is an important factor in the reaction of the host to the pathogen. Poor resistance is correlated with a low hydrogen-ion concentration of the juice, while a high tannin content confers ability to withstand infection. A negative correlation was observed between dorsal pubescence and the resistance of the leaf to mycelial invasion. Seedlings of eight tea strains segregated in a manner suggesting the involvement of more than two dominant genes in the production of resistant types.

WIEHE (P. O.). **Un nouvel hôte de la mosaïque de Tabac à Maurice.** [A new host of Tobacco mosaic in Mauritius.]—*Rev. agric. Maurice, 1939*, 106, p. 101, 1939.

The author recently observed in Mauritius a plantation of *Mucuna deeringiana* showing symptoms of tobacco mosaic. The plantation had been made in a field which previously carried a crop of tobacco strongly attacked by the disease. Inoculations of month-old tobacco seedlings in an insect-proof greenhouse by rubbing the leaves with juice from affected *M. deeringiana* plants gave positive results. On the tobacco seedlings the disease was much more severe than on the original host, the symptoms on tobacco including leaf-dwarfing and enations. Growers have been advised not to use *M. deeringiana* as a cover crop for rotation with tobacco.

KAUSCHE (G. A.) & STUBBE (H.). **Über die Entstehung einer mit Röntgenstrahlen induzierten 'Mutation' des Tabakmosaikvirus.** [On the origin of a Tobacco mosaic virus mutation induced by Röntgen rays.]—*Naturwissenschaften*, xxvii, 29, pp. 501–502, 2 figs., 1939.

In further experiments on the activation of the tobacco mosaic virus by means of X-rays [*R.A.M.*, xviii, p. 209], the writers subjected tobacco leaves containing 'normal' virus to irradiation in the range of 12,000 to 14,000 r. The inoculation of the juice extracted from the treated foliage into *Nicotiana langsdorffii* or *N. glutinosa* at first resulted in the development of 'normal' single lesions. These were isolated singly, extracted for 12 hours with m/15 phosphate buffer, and inoculated separately into plants of the susceptible Samson tobacco variety. Qualitative differences between the symptoms developing in the plants treated with 'normal non-irradiated' juice and that 'remaining normal after irradiation' were observed in the following directions. 1. A large percentage of the plants inoculated with 'normal' or 'irradiated normal' juice reacted, after a protracted incubation period (16 days longer than usual), by very faint or atypical mosaic symptoms. 2. In 1 to 2 per cent. of the plants inoculated with irradiated single-lesion juice, completely aberrant features, distinct from 'normal', aucuba, and yellow mosaic, developed and remained constant in transfers. Presumably a few protein molecules undergo some qualitative modification as a result of X-ray irradiation.

STANLEY (W. M.). **The isolation and properties of Tobacco ring spot virus.**—*J. biol. Chem.*, cxxix, 2, pp. 405–428, 1 fig., 1 diag., 1939.

A full account is given of the isolation of the nucleoprotein of the tobacco ring spot virus [*R.A.M.*, xvi, p. 568; xvii, p. 543] by means of differential centrifugation from diseased Turkish tobacco plants at the Rockefeller Institute for Medical Research, Princeton, [New Jersey]. The protein is denatured and inactivated by heating to 64° C., by treatment with nitrous acid, hydrogen peroxide, or 36 per cent. urea in 0·01 M phosphate at P_H 7, by standing at room temperature in aqueous solution, or by subjection to hydrogen-ion concentrations more alkaline than P_H 9 or more acid than about 6. A similar loss of activity follows freezing in solutions containing no extraneous materials,

but varying degrees of protection are afforded by the presence of electrolytes, plant pigments, or nutrient broth. One precipitation of ring spot virus with 30 per cent. ammonium sulphate at 4° causes substantial inactivation. Although solutions of the virus in 0·01 M phosphate buffer are fairly stable, there is a marked increase in viscosity and a somewhat rapid loss of activity in aqueous solution. Ring spot virus solutions containing 0·01 M phosphate buffer produced many more lesions on Black Eye cowpea leaves than those with a more concentrated or dilute phosphate buffer or other electrolytes (twice and four times the numbers obtained with 0·1 and 0·001 M phosphate buffer, respectively).

The tobacco ring spot virus has a sedimentation constant of 115×10^{-13}, an isoelectric point of P_H 4·7, a specific gravity of 1·57, yields isotropic pellets on ultracentrifugation, and exhibits no double refraction of flow. The molecular weight and diameter of the virus, based on some of these constants and on ultrafiltration data, are 3,400,000 and 19 mμ, respectively. Tobacco ring spot is the smallest of the viruses hitherto isolated and appears to be essentially spherical. It is quite unstable in comparison with tobacco mosaic and has not yet been secured in crystalline form. It contains some 40 per cent. nucleic acid, giving negative and positive reactions, respectively, to the desoxy sugar and pentose tests. The nucleic acid content is about eight times that of the tobacco mosaic virus, approaching the sperm nucleoproteins in this respect. The ring spot virus gives a specific precipitin reaction with its antiserum.

STANLEY (W. M.). **Isolation of virus from plants recovered from the Tobacco ring spot disease.**—*J. biol. Chem.*, cxxix, 2, pp. 429–436, 1 fig., 1939.

Apparently normal tobacco leaves recovered from ring spot [see preceding abstract] were found to contain about one part of virus in 500,000 of fresh green leaf material, the corresponding figure for leaves on the same plants bearing many necrotic lesions being 1 in 80,000. No difference could be detected in the activity, sedimentation constant, isoelectric point, or general properties of the virus from the two sources, and it is therefore inferred that the infective principle is identical in both recovered and systemically diseased foliage. Recovery results from an adjustment of the host to the virus, apparently involving a gradual reduction of the level of concentration reached by the latter to about one-sixth of its original strength, a process accompanied by the disappearance of visible symptoms of the disease. Immunity would seem to be a sequel to the persistence of a low concentration of unaltered ring spot virus in recovered plants.

NAGHSKI (J.), HARRIS (R. G.), HALEY (D. E.), & REID (J. J.). **Plant nutrition and disease resistance.**—Abs. in *J. Bact.*, xxxviii, 2, pp. 234–235, 1939.

Continuing their studies at the Pennsylvania Agricultural Experiment Station on nitrogen uptake in relation to the susceptibility of tobacco to leaf spots [*Bacterium tabacum* and *Bact. angulatum*: *R.A.M.*, xviii, p. 764], the writers found that this does not depend on the amount

absorbed (within reasonable limits), but on the stage in the life of the plant at which the element is assimilated. Thus, plants grown with adequate mineral utilization may mature with a nitrogen content of over 4 per cent. without significant loss of resistance to leaf spots if the nitrogen is supplied uniformly during the period of active growth. On the other hand, acute susceptibility may be shown by plants with a nitrogen content of less than 2 per cent. acquired erratically, with considerable quantities available at the approach of maturity. It is inadvisable, therefore, to use fresh animal manure, old legume refuse, or other sources of nitrogen providing a fluctuating and late supply of the element in the fertilization of tobacco and similar short-season crops.

HARRIS (R. G.), NAGHSKI (J.), FARRELL (M. A.), & REID (J. J.). **The relation of the soluble specific substance to virulence and specificity in bacterial leafspot organisms.**—Abs. in *J. Bact.*, xxxviii, 2, pp. 235–236, 1939.

Laboratory animals were immunized with cultures of *Pseudomonas fluorescens* and the cultures then cultivated in the presence of the homologous antiserum until 'R' forms were secured. These were used for immunization and the resultant 'R' cultures grown in the presence of the homologous antiserum and killed cells of *Phytomonas tabaci* [*Bacterium tabacum*: see preceding abstract], a procedure which yielded 'S' forms culturally and serologically identical with strains of the tobacco wildfire organism. In inoculation experiments the 'S' forms also produced on tobacco plants lesions identical with those of *Bact. tabacum*.

Similarly, 'R' forms of *Bact. tabacum* were obtained and cultivated in the presence of the homologous antiserum and killed cells of *Pseudomonas fluorescens*. The 'S' forms so derived were culturally and serologically identical with the strains of *P. fluorescens* killed and used in the culture medium. These 'S' forms gave negative results in inoculation tests.

Agglutinin absorption studies showed the 'R' strains produced from *P. fluorescens* and *Bact. tabacum* to be serologically identical. The same relationship was further found to exist between *P. fluorescens* and several other representatives of *Phytomonas*, including *P. angulata* [*Bact. angulatum*], *P.* [*Pseudomonas*] *cerasi*, *Phytomonas* [*Bact.*] *primulae*, and *P.* [*Bact.*] *vignae*. It is concluded from these data that specificity and virulence are associated with the nature of the soluble specific substance in this group of organisms.

PFANKUCH (E.) & KAUSCHE (G. A.). **Darstellung und Charakterisierung von Aucubamosaik-Virus.** [The preparation and characterization of the aucuba mosaic virus.]—*Biochem. Z.*, cccii, 1–2, pp. 77–83, 1 fig., 1 graph, 1939.

Using the same methods as those employed in previous work on the purification and characterization of the tobacco mosaic and potato X viruses [*R.A.M.*, xviii, p. 764 *et passim*], the writers isolated the tomato aucuba mosaic virus from diseased Samson Bashi Bagli tobacco plants and detected a close correspondence between the sedimentation curves and gold sol reactions of the tobacco and aucuba

mosaic viruses [ibid., xviii, p. 556], whereas potato virus X occupied an entirely different position in both respects. Both the tobacco and aucuba mosaic viruses attain their maximum sedimentation curve at an ammonium sulphate concentration of 25 per cent., as against 37·5 per cent. for potato virus X, and the gold sol reactions of the two former were also similar, passing from blue to bluish-purple flocculation and showing no trace of the red typical of potato virus X.

FISH (S.). **Tomato diseases and their control.**—*J. Dep. Agric. Vict.*, xxxvii, 8, pp. 378–391, 28 figs., 1939.

Brief, popular notes are given on the symptoms and control of the more important diseases affecting tomatoes in Victoria, including among many others *Phytophthora cryptogea* as a cause of damping-off; black dot root disease (*Colletotrichum atramentarium*) [*R.A.M.*, xvii, p. 96; cf. also ibid., xviii, p. 813], speck disease (*Bacterium punctulans*) [ibid., xvi, p. 820], and sun scald.

Black dot has sometimes caused serious damage in northern Victoria. The chief effect of an outbreak is to cause premature death, generally by the end of February, a serious matter in a locality where late crops are grown for pulping. In order to control the disease seedlings should be raised in sterilized soil, only healthy seedlings should be planted, and then only on land that has not grown tomatoes for several years, soil moisture should be kept fairly constant, diseased plants should be removed and burnt, and potatoes should not be included in the rotation.

Bacterial speck is of recent occurrence in Victoria. Seed sterilization and rotation should check the disease.

Sun scald may be identified by the whitish, leathery, sometimes wrinkled, patch on the side of the fruit exposed to the sun. Killing results from the combined effect of heat and light. Precautions against conditions producing defoliation will reduce sun scald.

HARTSUIJKER (K.). **Peritheciën van den Eikenmeeldauw : Microsphaera quercina (Schw.) Burr.** [The Oak mildew perithecia: *Microsphaera quercina* (Schw.) Burr.]—*Tijdschr. PlZiekt.*, xlv, 4, pp. 162–165, 1939.

Attention is drawn to the detection, for the first time in Holland, early in January, 1939, of the perithecia of *Microsphaera quercina* on oak (*Quercus pedunculata*) seedlings [*R.A.M.*, xvii, p. 438] in a warm frame at the Cantonspark, Baarn. Previous literature on the occurrence of the perithecial stage of *M. quercina* is briefly reviewed, and it is pointed out that the only countries from which the perfect phase is now absent are Great Britain, Belgium, and Scandinavia, probably on account of the predominantly adverse mean temperature and atmospheric humidity relations prevailing in these regions.

WILKINS (W. H.). **Studies in the genus Ustulina with special reference to parasitism. V. A disease of Elm (Ulmus campestris Sm.) caused by Ustulina.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 171–185, 5 figs., 1939.

A fungus isolated from an elm tree felled near Princes Risborough was identified in pure culture as *Ustulina vulgaris* [*R.A.M.*, xviii,

p. 638] and determined as the sole agent of the disease by reinfection and subsequent reisolation. The tree showed no external symptoms of disease, but when felled the base of the trunk was found to be rotten in the centre. In both stem and roots the infected regions showed a more or less concentric zone of dark-coloured heart wood, surrounding the pale and brittle diseased wood, the peripheral layer remaining healthy. The disease was confined to the heart wood and extended up the trunk for a distance of about 10 ft. and into the roots for about 3 ft. Sections from the diseased tree showed the diseased area to be clearly deliminated by a black line, about 1 mm. wide, from the healthy heart wood, no hyphae being found outside it on microscopic examination of stained preparations. The first stage of decay in the elm wood is characterized by the occlusion of the fibres and wood parenchyma by infiltration products, probably some kind of lignin, which fill the fibres completely but are usually absent from the vessels, and the second by disintegration of wood tissue leading eventually to an almost complete disappearance of the fibres and wood parenchyma and to a considerable breakdown of the vessels of the summer wood. The medullary rays and large vessels of the spring wood alone resist disintegration. The disease of elms is stated to resemble closely that of lime, caused by the same fungus, and the final result of the decay to be almost identical in both.

Goidànich (G.). **Note fitopatologiche. I. Malattia dell' 'Ulmus pumila' L. causata da una Teleforacea.** [Phytopathological notes. I. A disease of *Ulmus pumila* L. caused by a member of the Thelephoraceae.]—*Boll. Staz. Pat. veg., Roma*, N.S., xix, 1, pp. 103–111, 7 figs., 1939.

In 1938 branches of *Ulmus pumila* taken from a tree showing symptoms resembling those due to *Graphium* [*Ceratostomella*] *ulmi* were received at Modena for examination. The wood showed a dark brown discoloration and from the infected material a Basidiomycete was consistently isolated, which in culture formed hemispherical, chestnut-coloured bodies, ½ to 2 cm. in diameter, and clavate basidia with hyaline, slightly opaque, ellipsoidal-oval, apiculate basidiospores, 3·5 to 5·1 by 2·2 to 3·2μ. It is suggested that the fungus may be a species of *Peniophora*.

Goidànich (G.) & Vivani (W.). **Il ritrovamento dell' ascomicete 'Didymosphaeria populina' Vuill., parassita del Pioppo.** [The finding of the Ascomycete '*Didymosphaeria populina*' Vuill., a parasite of Poplar.]—*Boll. Staz. Pat. veg., Roma*, N.S., xix, 1, pp. 87–102, 2 pl., 4 figs., 1939.

Further cultural studies with *Pollaccia radiosa* from poplars in Italy [*R.A.M.*, xvii, p. 137] showed that the round bodies or rudimentary perithecia previously observed developed into fertile stromata or sclerotia externally indistinguishable from the former. The fertile stromata measured 89 to 268 (average 157)μ in diameter, but were often flattened at the sides, when they measured 141 to 219 (187) by 116 to 180 (152)μ. They were characterized by 4 to 12 loculi containing asci 136 to 170 (139) by 20·5 to 23·2 (21·5)μ with 8 (sometimes 6) light

brown to dark green, bicellular ascospores 23·7 to 33·5 (27·3) by 10·3 to 15·6 (14·2)μ, the larger cell being more or less hemispherical and the smaller conical with bulging sides. The ascospores were arranged in a single row with the rounded end generally facing the distal part of the ascus, or occasionally in a double row in the basal part. No ostiole was noted, the ascospores being released through a rupture in the wall.

There is no doubt that this fungus is the same as that described by Vuillemin in 1889 as *Didymosphaeria populina* [ibid., xvi, p. 71]. It is genetically related to *P. radiosa* (*Napicladium tremulae*), in the life-cycle of which the Sphaeropsid fungus associated with the same disease [loc. cit.] plays no part. *D. populina*, both in its ascigerous and imperfect stages, is a true parasite, causing conspicuous lesions on the leaves of vigorously growing poplars.

It is stated in a footnote that the fungus described by Servazzi in a paper issued while the present one was in the press as *Venturia populina* [ibid., xviii, p. 639] is evidently identical with the authors' fungus.

Smith (D. J.) & Smith (C. O.). **The use of special media for sporulation of fungi.**—*Phytopathology*, xxix, 9, p. 821, 1939.

Sporulation of the leaf-spotting fungi, *Stigmella platani-racemosae*, *Mycosphaerella stigmina-platani*, and *M. platanifolia* [*R.A.M.*, xvii, p. 492], was obtained on juice expressed from *Platanus racemosa* leaves, sterilized by filtration through Chamberland filters, and placed as drops either in van Tieghem cells or on slides in Petri dishes. Abundant spermatia were formed by these organisms on sterile filter paper in tubes to which the medium was added aseptically.

Bier (J. E.). **Hypoxylon canker of Maple.**—*Forest. Chron.*, xv, 2, pp. 122–123, 1 pl., 1939. [Abs. in *Biol. Abstr.*, xiii, 8, pp. 1401–1402, 1939.]

An account is given of a canker of maples (*Acer rubrum* and *A. saccharum*), associated with a species of *Hypoxylon*, probably *H. blakei*, at the Petawawa Forest Experiment Station, Ontario, Canada.

Brinkerhoff (L. A.). **Pathogenicity and pathological histology of Phymatotrichum omnivorum in a woody perennial, the Pecan.**—Abs. in *Phytopathology*, xxix, 9, p. 823, 1939.

Pecan roots showing incipient symptoms of infection by *Phymatotrichum* [in Arizona: *R.A.M.*, xiii, p. 639; xvii, p. 504] were found to be extensively damaged, but they may survive for periods of up to two years by means of shallow roots that have escaped infection. Recovery depends largely on the capacity for abundant adventitious root production after treatment. Roots of all sizes above $\frac{1}{8}$ in. in diameter readily contracted infection in inoculation experiments, the incubation period in August being about nine days and the average daily rate of spread of the fungus along the roots, primarily by means of strands over the surface, during July and August ranged from 0·6 to 0·8 in. Initial penetration was effected most rapidly through the lenticels, but was also observed to take place through the point of emergence of lateral roots and by way of normal breaks in the periderm, in the tissues underlying which, as well as in the cambial region, lateral dispersal is speedy. The pitted medullary ray cells are the main channels of radial penetration. Starch soon disappears from the invaded cells. Granular deposits

consisting of suberin or an allied substance were found in profusion in the zone of infection.

Streets (R. B.). **The effect of intercrops and forage crops on the incidence and severity of Phymatotrichum root rot on Pecan.**—Abs. in *Phytopathology*, xxix, 9, p. 827, 1939.

Nearly all the serious outbreaks of root rot (*Phymatotrichum*) [*omnivorum*] in Arizona pecan [see preceding abstract] groves are stated to have occurred in areas intercropped with lucerne [*R.A.M.*, xii, p. 516], the roots of which provide a substratum over which the fungus moves rapidly and infects the trees. For example, in a 40-acre pecan grove on infected soil interplanted with lucerne there were 195 diseased trees after two years compared with only 58 in an adjacent orchard on even more heavily infested ground. Following removal of the susceptible intercrop, there is a gradual drop in the incidence of root rot, e.g., 114 new cases developed in June, 1938, in a 50-acre grove from which the lucerne was eradicated in the previous August, but only five in June, 1939.

Jessen (W.). **Kalium- und Magnesiummangelerscheinungen und Wirkung einer Düngung mit Kaliumchlorid und Kalimagnesia auf das Wachstum verschiedener Holzarten.** [Potash and magnesium deficiency symptoms and the effect of manuring with potassium chloride and potash magnesia on the growth of various kinds of trees.]—*Ernähr. Pfl.*, xxxv, 8, pp. 228–230, 5 figs., 1939. [English and Spanish summaries on pp. 255–256.]

In a series of experiments at the Hann.-Münden College of Forestry, Germany, in which pine, spruce, and larch seedlings were grown in Neubauer dishes on quartz sand with and without potassium chloride and potash magnesia, chlorosis of the pine and spruce needles receiving no potash developed in July, followed in September by brown and reddish-purple discolorations [cf. *R.A.M.*, xvi, p. 573; xvii, p. 573]. In the pine seedlings the needle symptoms extended about half-way down from the tip, while the entire surface of the spruce needles was covered with brown spots. At the same time the larch needles became conspicuously chlorotic. Magnesium deficiency was characterized by reddish-brown and pale to livid discolorations of the needle tips of pine and spruce, respectively. Substantial yield increases in the dry weight of all three conifers were obtained by the application of potash in both forms.

Minkevičius (A.). **Veimutrūdes, Cronartium ribicola Dietrich, išsiplatinimo Lietuvoje, jos žalingumo ir jos žiemojimo Klausimu.** [The distribution in Lithuania of the Weymouth rust, *Cronartium ribicola* Dietrich, its effects and its overwintering on Currants.]—*Mém. Fac. Sci. Univ. Lithuanie*, xiii, 2, pp. 97–133, 1 fig., 2 graphs, 1 map, 1939. [English summary.]

The aecidial stage of *Cronartium ribicola* is stated to have been observed in 11 out of the 33 districts of Lithuania in which white pines (*Pinus strobus*) are cultivated. In 1937 *P. flexilis* was also attacked by the rust in the Kaunas Botanical Garden, where a series of experiments was carried out from 1935 to 1938 to investigate various important points in connexion with the disease.

Ten black currant bushes were planted between young infected white pines at short distances, while a further ten (controls) were set 1 km. away and observations were also made on others situated at various points outside a radius of 0·5 km. from the trees. The dates of the first appearance of the aecidia on *P. strobus* in the four years of the tests were 12th, 9th, and 13th April and 31st March, respectively, the corresponding dates for the primary outbreak of uredospore infection on currants (*a*) interplanted, (*b*) controls, and (*c*) outside the 0·5 km. radius being 3rd June, 15th, 13th, and 31st May, respectively, 27th July, 8th and 3rd June, and 28th July, respectively, and 2nd July, 5th and 7th June, and 7th July, respectively. Mass uredospore production on the interplanted currants began on 20th June, 22nd and 25th May, and 17th June, respectively, in the four experimental years, the corresponding dates for the controls in 1935, 1936, and 1937 being 26th September and 19th and 7th July, respectively, and for those outside the 0·5 km. radius 4th and 21st July and 2nd August, respectively, in 1936, 1937, and 1938. Currants interplanted among white pines were attacked not only earlier, but more severely, than those at a distance. Similar results were obtained in 1936 with the less susceptible red currants and gooseberries.

Discussing the problem of the overwintering of the white pine blister rust, the author's observations point to the extreme improbability of perpetuation by the uredospores in the climate of Lithuania. In a preliminary test in 1937, these organs retained their viability only for a month in the laboratory, while their capacity for the infection of black currant leaves after two months in the open was very slight. Moreover, the first spring outbreaks occur at the same time and with similar intensity on currants growing *en masse* or scattered, and irrespective of the extent of the previous season's infection. Likewise, the hypothesis that *C. ribicola* overwinters in the mycelial stage in currant tissues is inadmissible, the effect of the rust on the same bushes varying from year to year [*R.A.M.*, iv, p. 376]. Under Lithuanian conditions, therefore, the fungus survives from year to year only on white or other five-needled pines, from which the aecidiospores are disseminated in the early spring to currants in the vicinity. These in their turn produce, at the end of May or beginning of June, primary uredospores which are conveyed by the wind to the nearest currant bushes and there form mycelium and secondary uredospores. Allowing for a uredospore incubation period of 12 to 14 days and a sporulating season of at least eight weeks, four generations of uredospores may be produced during a growing season. The quantity of each generation increasing by geometrical progression, a few foci of aecidial infection on white pines will obviously suffice to spread the disease throughout the currant-growing districts of the country in the space of two to three months.

KANGAS (E.). **Tutkimuksia Mäntytaimistotuhoista ja niiden merkitykestä.** [Investigations on the injuries occurring in Pine seedling stands and their importance.]—*Commun. Inst. for. fenn., 1937–8* 24, pp. 1–304, 25 figs., 1 map, 1938. [German summary. Received 1939.]

This exhaustive, fully tabulated, survey of the various forms of

injury occurring in Finnish pine stands in the early stages of growth contains the following information regarding fungal damage. *Cronartium peridermii-pini* [*C. asclepiadeum*: *R.A.M.*, xviii, p. 73] generally causes the death of the branches, twigs, and stems, spreading rapidly during the first summer; a typical feature of infection is a mosaic-like rupture of the cortex. The portions of the stem above the site of invasion become desiccated. *Dasyscypha fuscosanguinea* [ibid., xiv, p. 266] is also fatal to young trees, though its course may be slower than that of the rust. The cankers frequently start at the stem base. This pathogen is particularly severe in the north of the country.

Fungi attacking the needles are *Lophodermium pinastri* [ibid., xviii, p. 360], which often constitutes a critical factor in the well-being of stands up to ten years old (16 in the north); *Phacidium infestans* [ibid., xvii, p. 86], even more decisive within the same age limits, especially in the north; *Hypodermella sulcigena* [ibid., xviii, p. 490], mainly confined to the needles on the shoot tips and of less importance than the two foregoing; and *Coleosporium* spp., which as a rule attack only the third-year needles, causing a brown discoloration and shedding but not otherwise harming the trees.

Melampsora pinitorqua [ibid., xvii, p. 214] may be responsible for heavy damage to the shoots in the north, inducing desiccation, deformation, or even killing the young growth, in which case adventitious buds are put out and a bushy appearance imparted to the trees.

Armillaria mellea [ibid., xvii, pp. 714, 715] causes rapid desiccation, discoloration, needle fall, and finally death.

BADCOCK (E. C.). **Preliminary account of the odour of wood-destroying fungi in culture.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 188–198, 1 fig., 1939.

The odour of cultures of wood-destroying fungi is considered to be a valuable diagnostic character, and may also be useful in the study of their metabolism. The characteristic odour developed usually when the cultures were about six weeks old and was identical in the several strains of the same fungus, even when isolated from different hosts, and remained constant in duplicated tests. Many species, the natural fruit bodies of which had no perceptible odour, produced a distinct aroma from the mycelium in culture. A striking similarity of odour appeared to exist among some related species, but no two species have been found with precisely the same odour.

A table is presented showing the odour of cultures of eighty different species of wood-destroying fungi and, where available, the smell of the natural fruit bodies of these species as recorded by various authors. A list of the odours of the natural fruit bodies of the higher fungi, compiled by E. J. Gilbert (Méthode de mycologie descriptive. Les livres du mycologue, iv, Paris. Le François, 1934) is appended. Fungi in which odour has already been found to assist in identification are *Trametes suaveolens* (with an odour resembling anisaldehyde), *Stereum sanguinolentum* (fragrant), *Lenzites trabea*, *Pholiota adiposa*, *Lentinus lepideus*, *Polystictus versicolor*, and three others.

BUCHWALD (N. F.). **Rødkaernet Bøgetraes Modstandsevne mod tømmersvampe (Merulius lacrymans, Coniophora cerebella og Polyporus vaporarius).** [The capacity of red-heart Beech wood for resistance to timber fungi (*Merulius lacrymans, Coniophora cerebella,* and *Polyporus vaporarius*).]—*Dansk Skovforen. Tidsskr., 1939,* pp. 238–251, 3 figs., 3 graphs, 1939.

A tabulated account is given of the writer's laboratory experiments at the Danish Agricultural College, Copenhagen, to determine the relative pathogenicity of malt extract cultures of three wood-destroying fungi, *Merulius lacrymans, Coniophora cerebella* [*C. puteana*], and *Polyporus vaporarius* [*Poria vaporaria*], to unimpregnated and impregnated wood blocks of white beech (*Fagus sylvatica*), unimpregnated blocks of red-heart beech (*F. sylvatica*), and impregnated blocks of mixed white and red-heart beech, unimpregnated blocks of spruce (*Picea abies*) [*R.A.M.*, xvii, p. 641] being included in one series for control purposes. Impregnation was carried out with tar oil in each case.

M. lacrymans was found to be the most destructive of the three fungi, causing losses of 48, 27, and 43 per cent., respectively, in unimpregnated white and unimpregnated red-heart beech and spruce in 7½ months, the corresponding percentages for *C. puteana* being 37, 29, and 31, and for *P. vaporaria* 22, 17, and 22, respectively. *M. lacrymans* made much slower progress than the other two organisms in the decomposition of the wood in the initial stages of the tests, but after five months the relative positions were reversed. Impregnated beech wood, both white and red-heart, sustained little damage from the pathogens under observation, the loss of weight amounting to only 5 to 6 per cent., mostly occurring during the first two months. The treated white wood seemed to be slightly more resistant than the red.

BROESE VAN GROENOU (H.). **Die Kreosotdurchtränkung von Buchenholz und die Faktoren die sie beeinflussen.** [The penetration of Beech wood by creosote and the factors influencing it.]—Thesis, Delft, 1938. [Dutch. Abs. in *Holz Roh- u. Werkstoff,* ii, 7–8, p. 307, 1939.]

Tyloses in beech wood vessels constituting a hindrance to the penetration of creosote [as a preservative against fungal infection], an intensive study was made of the conditions governing their formation. They were found to originate in the medullary ray parenchyma, and to develop in the vessels chiefly of living wood felled during the summer. The process may be partially counteracted, but not wholly prevented, by the speedy killing of the wood, e.g., by rapid drying, but the certain avoidance of tyloses can only be ensured by winter felling [cf. *R.A.M.*, xviii, p. 357]. Liquids such as water and alcohol, which induce swelling of the cell walls, are able to penetrate the wood in a radial direction, whereas 'apolar' fluids, benzol or creosote, for instance, cannot do so. Creosote can only traverse the vessels and tracheids, and its rate of penetration is a function of viscosity. The partial obstruction of the vessels by tyloses is believed to be responsible for various defects in the impregnation of railway sleepers.

LEVÓN (M.). **Some results of investigations dealing with the use of Birch as raw material for the plywood industry.**—*Papp. Trävarutidskr. Finl.*, xxi, 14, pp. 500–501; 15, p. 539; 16, pp. 569–570, 4 graphs, 1939.

Discussing the possibilities of an extended use of birch as a raw material for the Finnish plywood industry, the writer points out that felling the trees in leaf, though it reduces the water content of the trunks and assists floating, exposes the wood to much greater risks of bacterial and fungal infection than is the case with winter-felled logs [see preceding abstract]. By the latter half of August or the early part of September, however, felling may be carried out without any great danger of serious attacks by the micro-organisms which are the chief agents of discoloration in stored wood. Very good control of staining has been obtained by the Runbäck water-sprinkling method [*R.A.M.*, xvi, p. 575], whereby the logs and the surrounding atmosphere are maintained at a constant moisture-level, only about 7 per cent. discoloration developing in the treated material after five months as against roughly 28 per cent. in the untreated. Certain tarry substances, e.g., bitumen 80°/90°+10 per cent. creosote oil, applied to the ends of the logs, have also given promising results.

FINDLAY (W. P. K.). **Note on an abnormal fungus on Birch.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 169–170, 1 pl., 1939.

An interesting fungus was collected in 1938 on a birch tree at Aviemore, Inverness-shire, consisting of a coal-black mass about 30 cm. across, in general appearance suggesting a large clinker. It was very much cracked, extremely hard and brittle, dark reddish- to yellowish-brown in the interior with a very thin, carbonaceous external layer. There was no sign of any fertile tissue. The fungus grew readily on malt agar and produced basidia with hyaline or faintly yellowish basidiospores, 8 to 10 by 4 to 5μ. Dark brown, thick-walled, bulbous setae occurred in the hymenium. The organism is considered to be identical with that described by Mme Katayevskaya as the 'tchaga' fungus on birches in the U.S.S.R. [*R.A.M.*, viii, p. 345], and also with that described by Campbell and Davidson [ibid., xviii, p. 146] as a *Poria* belonging probably to the *P. obliqua* complex. In culture the fungus differed from *Fomes igniarius* while the size of the spores produced agreed closely with that given for *P. obliqua,* to which species the Aviemore fungus is probably related.

BRAJNIKOFF (B. J.). **Resin-impregnated wood.**—*Chem. Prod.*, ii, 3, pp. 71–77, 2 figs., 1 graph, 1939.

In this paper the author describes a method of impregnating wood with synthetic resins which is stated to render it exceedingly inert and immune from attack by micro-organisms. Treated wood is eminently suitable for electrotechnical apparatus.

CHIDESTER (MAE S.). **Further studies on temperatures necessary to kill fungi in wood.**—*Proc. Amer. Wood Pres. Ass.*, xxxv, pp. 319–324, 2 graphs, 1939.

Continuing her studies on the temperatures required to destroy fungi in wood [*R.A.M.*, xvii, p. 4], the writer exposed to a range of

104° to 212° F. sticks of *Pinus taeda* inoculated with *Fomes roseus*, *Lenzites trabea*, *Trametes serialis*, *Lentinus lepideus*, *Lenzites sepiaria*, and *Poria incrassata* [ibid., xviii, p. 285], of which the three last-named had already been used in the previous series of experiments. *P. incrassata* proved to be much the most sensitive to heating of all the fungi tested, while *L. trabea*, *L. sepiaria*, and *Lentinus lepideus* were the most resistant. The recommendations for the temperatures and heating periods at the zone of infection requisite for the destruction of the fungi under observation are the same as those already given, except that the time at 150° has been extended from 60 to 75 minutes owing to the resistance of *L. trabea*. Temperatures below 150° appear to be impracticable, the more resistant fungi surviving 12 hours at 140°, 20 at 131°, and 24 at 122°.

LINDGREN (R. M.) & SCHEFFER (T. C.). **Effect of blue stain on the penetration of liquids into air-dry Southern Pine wood.**—*Proc. Amer. Wood Pres. Ass.*, xxxv, pp. 325–337, 1939.

The absorption of water during periods ranging from ½ to 55 hours was found to be substantially greater in blocks of *Pinus taeda* wood stained by inoculation with *Endoconidiophora moniliformis*, *Graphium rigidum* [*R.A.M.*, xiv, p. 729], and *Hormonema* sp. than in matched unstained wood. No relation was observed between the amount of discoloration produced by the different fungi and the degree of absorption. The increased uptake of water was largely confined to the first half-hour of soaking, during which period the percentages for the blocks inoculated with *E. moniliformis*, *G. rigidum*, and *H.* sp. were 52·3, 53·7, and 42·2, respectively, compared with 30·2, 39·5, and 34·9 for the untreated controls; after five hours the unstained material absorbed as much water during a given time as the stained, or more.

The absorption of creosote applied as a hot-and-cold bath and as a pressure treatment was 110 to 140 and 140 to 150 per cent., respectively, greater in *P. palustris* bolts stained with *Ceratostomella pilifera* [ibid., xvi, pp. 578, 787] than in corresponding unstained material, penetration of the sapwood being complete in the former and only partial in the latter. An important factor in the greater penetrability of the stained wood is believed to be its increased porosity due to partial breakdown of the ray parenchyma, together with some direct penetration of the tracheid walls.

On the basis of these results, discrimination against air-dry stained wood on the grounds of reduced penetrability by liquids is considered to be untenable, but no argument in favour of the use of such material in commercial practice is hereby intended. Bright wood should be preferred whenever a choice is feasible, except where the reduction of decay to a negligible incidence has become a part of routine practice.

WINNIG (K.). **Der Schutz von Holzmasten bei der deutschen Reichspost.** [The protection of wooden poles in the German Postal Service.]—*Holz Roh- u. Werkstoff*, ii, 7–8, pp. 272–278, 1 graph, 1939.

This is a historical survey of the development of the measures adopted by the German Postal Service for the preservation of telegraph poles against insect and fungal damage since 1852. From this date to the

turn of the century zinc chloride, copper sulphate, mercuric chloride, and coal tar were used; of late years these have been largely replaced by fluorine derivates of sodium-di-nitrophenol and arsenic compounds, of which basilit UA (thanalith) [*R.A.M.*, xvii, p. 495] has proved to be the most effective. Full details are given of the Boucherie treatment with chrome arsenic-containing salt mixtures. Osmosis [ibid., xviii, p. 775] by means of osmolit U-arsen (of similar composition to basilit, with the addition of 5 per cent. of an adhesive glue), is recommended for newly felled wood. The conservative Rueping coal tar process [ibid., xvii, p. 2; xviii, p. 564] is considered to be superior to all other methods of timber preservation, the estimated duration of life of poles thus treated being 32 to 35 years compared with 30 to 32 for improved kyanization (a mixture of mercuric chloride and sodium fluoride); the number of poles impregnated by the Rueping process in Germany in recent years far exceeds those submitted to any other form of treatment.

MARCHIONATTO (J. B.). **Argentine Republic: first record of Erwinia carotovora in the country.**—*Int. Bull. Pl. Prot.*, xiii, 8, p. 177 M, 1939.

Attention is drawn to the recent detection, for the first time in the Argentine, of *Erwinia carotovora* on white cabbage and peppers [*Capsicum* spp.]. In laboratory experiments the organism proved severely pathogenic to peppers, tomatoes, cucumbers, potatoes, carrots, radishes, and kohlrabi. Heavy damage is caused not only in the field but in storage. Control measures should include crop rotation with cereals and forage crops, storage under dry, well-ventilated conditions at a temperature near 0° C., and disinfection of the storehouses with copper sulphate.

DENNIS (R. W. G.). **Notes on seed transmission of Phoma lingam in relation to dry rot of Swedes in Scotland.**—*Ann. appl. Biol.*, xxvi, 3, pp. 627–630, 1939.

During 1938, heavy losses from dry rot of swedes (*Phoma lingam*) [*R.A.M.*, xviii, p. 234] were sustained in north-eastern and south-western Scotland. In the Lothians the disease occurs on swedes in freshly broken old pasture, and in fields where a ten years' rotation has been practised.

Three samples of seed of known origin gave, respectively, 4, 5·66, and 1·74 per cent. infected seedlings [ibid., xiii, p. 487]. If, as Buddin estimates, 1 per cent. infected seed is equivalent to 3,000 infected seeds per acre, then 5 per cent. infection means sowing about one infected seed to each group of seedlings removed at singling. As, however, infected seedlings, if established, are probably cut down in singling, it becomes very unlikely that infection of a swede during autumn is due to infection of that plant from the seed at germination. The sowing of infected seed must, on the other hand, result in the distribution of infected debris very evenly over the fields. The solution of the problem would appear to consist in a more rigorous inspection and selection of seed plants.

In estimating the degree of seed infection the maximum amount of direct sunlight during germination is requisite for diagnosis from pycnidial development. Brown markings or stripes on the hypocotyl

of seedlings are not a sufficient indication of infection by *P. lingam*, as they may be caused by *Alternaria brassicae* or *Cladosporium* sp.

Le Clerg (E. L.). **Studies on dry-rot canker of Sugar Beets.**—*Phytopathology*, xxix, 9, pp. 793–800, 2 figs., 1939.

The average hyphal diameter of six isolates of sugar beet dry rot canker (*Rhizoctonia* [*Corticium*] *solani*) [*R.A.M.*, xviii, p. 776] collected during the summers of 1936 and 1938 in Minnesota and Colorado ranged from 7·4 to 8 μ after 14 days on potato dextrose agar, the corresponding figure for a beet crown rot isolate being 8·6 μ. In a comparative study on three artificial media the average radial growth of the same six dry rot canker isolates, six from crown rot, and six from potato, was 22·2, 34·6, and 20·6 mm., respectively. The optimum temperature for the two lots of beet isolates was 30° C., while those from potato throve best at 25°.

The results of greenhouse experiments in soil-temperature tanks showed the dry rot canker pathogen to be most active in root decay at 30° to 35°, with a relatively low soil moisture content. In soil inoculation tests at 18° to 20°, the dry rot canker and crown rot isolates were about equally virulent (average 21·4 and 21·9 per cent., respectively) in the causation of maize rot, the pathogenicity of the potato group being much weaker in respect of this host (4·4 per cent.). In experiments on peas, sugar beets, and cabbage the average reduction of stand caused by the dry rot canker group was 35·7, 14·1, and 12 per cent., respectively, the corresponding figures for crown rot strains being 77·1, 59, and 55, and for potato strains 13·3, 9·4, and 14. In another series of tests the average losses from four of the dry rot canker isolates on beans [*Phaseolus vulgaris*], peas, sugar beets, and cabbage were 38·4, 73·5, 10·2, and 34 per cent., respectively, and from the same number of crown rot strains 78·3, 100, 94·1, and 91·3.

In comparative inoculation tests on sugar beets with one isolate each of the dry rot canker and crown rot groups, the former produced the typical deep, localized lesions and the latter a more generalized decay. Though the differences between the dry rot canker and crown rot pathogens appear to warrant specific distinction, such a step is considered inadvisable until the perfect stage of the former has been found.

Dundas (B.) & Scott (G. W.). **Physiologic strains of Bean rust.**—*Phytopathology*, xxix, 9, pp. 820–821, 1939.

In comparative inoculations with four physiologic races of bean [*Phaseolus vulgaris*] rust [*Uromyces appendiculatus*: *R.A.M.*, xviii, p. 366], viz., two described and supplied by Harter [ibid., xiv, p. 669] and one each from the commercial fields of Washington and Florida, on three differential varieties, Brown Kentucky Wonder No. 928 proved to be resistant to Harter's two and the Florida strain but susceptible to that from Washington, Tennessee Green Pod was highly susceptible to all except the Florida strain, while Golden Gate showed high resistance to all except Harter's race 2. It is thus apparent that the Washington and Florida collections of *U. appendiculatus* differ from each other as well as from Harter's strains.

DUNDAS (B.). **Inheritance of resistance to powdery mildew in Runner Beans (Phaseolus coccineus), Tepary Beans (P. acutifolius), Yard Long Beans (Vigna sesquipedalis) and Cowpeas (Vigna sinensis).**— Abs. in *Phytopathology*, xxix, 9, p. 824, 1939.

Runner (*Phaseolus coccineus*), tepary (*P. acutifolius*), and yard-long beans (*Vigna sesquipedalis*), and cowpeas were found to comprise varieties both resistant and susceptible to various bean and cowpea strains of powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, x, p. 74; xvi, p. 796; xviii, p. 465]. Crosses were made between the resistant and susceptible varieties and have been maintained through the F_2 generation. All the resultant F_1 plants were resistant, while the F_2 progeny segregated in a ratio of 3 resistant to 1 susceptible, denoting that resistance to strains 2 and 3 in the Gray Mottled tepary, in Blackeye cowpeas, and in *V. sesquipedalis* is due to a single dominant Mendelian factor. Moreover, the individual F_2 plants of tepary and *Vigna* reacted identically to strains 2 and 3, showing that a single factor operates in both instances. The F_2 from a cross between a resistant Blackeye and a resistant yard-long yielded exclusively resistant progeny, showing that both contain the same factor for resistance.

FREITAG (J. H.) & SEVERIN (H. H. P.). **Additional Celery viroses.**— Abs. in *Phytopathology*, xxix, 9, p. 824, 1939.

Pseudo-calico, a new virus of celery in California, has not been transmitted, unlike celery crinkle leaf, poison hemlock [*Conium maculatum*] ring spot, and celery yellow spot [*R.A.M.*, xviii, p. 369], by any of the nine species of aphids breeding on the host. The crinkle leaf and ring spot viruses were retained by their aphid vectors for less than 24 hours, whereas that of yellow spot was harboured by the honeysuckle aphid (*Rhopalosiphum melliferum*) for twelve days. The pseudo-calico and ring spot viruses have been transmitted by sap inoculation, but not that of yellow spot. The ring spot has further been transmitted with difficulty from parsley to parsley but not to celery. The thermal inactivation point, dilution tolerance, and longevity *in vitro* of pseudo-calico are 70° C., 1 in 1,000, and five days, respectively, the corresponding figures for crinkle leaf being 60°, 1 in 100, and three days, respectively. Pseudo-calico has so far been transmitted to twelve species of plants in five families, whereas the host ranges of crinkle leaf and ring spot are limited to the Umbelliferae.

CHAMBERLAIN (E. E.). **Cucumber-mosaic (Cucumis virus 1 of Smith, 1937).**—*N.Z. J. Sci. Tech.*, A, xxi, 2, pp. 74–90, 7 figs., 1939.

Cucumber mosaic [*R.A.M.*, xviii, p. 726], first observed in New Zealand in 1931 and described by the author under the name of 'narrow leaf' of tomato [ibid., xiv, p. 462], causes serious losses in the cucumber, rock melon (*Cucumis melo* var. *cantalupensis*), and tomato crops in the Poverty Bay district, and of the last-named also at Christchurch, other natural hosts being vegetable marrow and *Polyanthus*. The virus is perpetuated by marrow seed and transmitted from diseased to healthy plants by *Aphis gossypii*, *Myzus persicae*, and *Macrosiphum solani*. In greenhouse inoculation experiments the juice of diseased marrows or cucumbers successfully transmitted infection to tobacco, *Nicoti-*

ana rustica, *Physalis peruviana*, eggplant, *Datura stramonium*, chilli, *Petunia hybrida*, blue, yellow, and flowering lupins (*Lupinus angustifolius*, *L. luteus*, and *L. polyphyllus*), pansy, violet, [China] aster (*Callistephus chinensis*), *Primula sinensis*, *P. obconica*, and spinach, brief descriptions of the symptoms on these hosts being given. The virus was found to survive a period of over four days *in vitro*; its dilution end and thermal death points are 1 in 1,000 and 62° to 66° C., respectively, and it failed to traverse a 'preliminary' Mandler filter (requiring a pressure of 5 lb.). Control measures based on sanitary precautions are briefly indicated.

THOMAS (K. M.) & KRISHNASWAMI (C. S.). **Little leaf—a transmissible disease of Brinjal.**—*Proc. Indian Acad. Sci.*, Sect. B., x, 2, pp. 201–212, 2 pl., 1939.

The new disease of brinjal [eggplant], apparently due to a virus, recently observed at Coimbatore [*R.A.M.*, xviii, p. 90], damaged nearly 50 per cent. of the crop at Nilampur in 1938. The chief symptom is a reduction in leaf size, the new leaves becoming smaller and smaller and almost sessile. The lamina becomes thin, soft, glabrous, and pale green. In thorny varieties the thorns are attenuated or absent. The growth of axillary and latent buds is stimulated, and the internodes are shortened. The suppressed branches with numerous reduced leaves become crowded together at the axils, the affected plants becoming so bushy as to be scarcely recognizable. Frequently there is no trace of the floral parts, and where these are present the corolla, androecium, and gynoecium are green. When the condition develops after flower formation, the flowers are shed and fruits are seldom set. Plants become affected in all stages of growth. No virus disease with the symptoms described appears to have been recorded hitherto, and K. M. Smith has suggested *in litt.* that the virus be named *Datura* virus 2.

The disease also occurs in nature on purple and white varieties of *D. fastuosa*. On the former, phyllody is sometimes present, but the flowers are often normal, and viable seeds are seldom produced. All South Indian eggplant varieties appear to be susceptible.

Sap inoculations from affected eggplants gave negative results, but the disease was successfully transmitted by grafting from eggplant to eggplant, tomato, tobacco, *D. fastuosa* (white and purple), and *Solanum trilobatum*, from tomato to tomato, from *D. fastuosa* to eggplant, and from purple *D. fastuosa* to tomato. Insect transmission was effected by means of *Empoasca devastans* from eggplant to eggplant, and by means of *Eutettix phycitis* from eggplant to eggplant and to *S. xanthocarpum*. Both Jassids are common locally. When two lots of seed from partially diseased eggplants and *D. fastuosa* were sown under insect-proof conditions, no disease appeared on the seedlings.

Control measures recommended until resistant varieties are found consist in the eradication of Solanaceous weeds and prompt roguing out of diseased plants. In a field where these measures were applied the incidence of disease was markedly diminished.

SHAW (L.). **Control of Cercospora leaf spot of Peanut with various dusts and sprays.**—Abs. in *Phytopathology*, xxix, 8, p. 751, 1939.

In 12 experimental one-acre groundnut plantings in North Carolina

in 1937 and in 15 in 1938, sulphur dust was applied at the rate of 16 lb. per acre on 25th July, 14th August, and 1st September for the control of leaf spots (*Cercospora*) [*personata* and *C. arachidicola* =*Mycosphaerella berkeleyii* and *M. arachidicola*: *R.A.M.*, xviii, p. 571], the incidence of which was thereby reduced by about 75 per cent. in each season, the corresponding decrease in defoliation from the treatment being estimated at 70 per cent. The average increases in the nut crops on the dusted plots were 343 lb. in 1937 and 217 in 1938, while the hay yield was substantially augmented in both years. In $\frac{1}{40}$-acre test plots in 1938, three applications of 4–4–50 Bordeaux mixture, $1\frac{1}{2}$ to 50 cuprocide 54 [ibid., xviii, p. 787], or sulphur dust effectively combated the leaf spots and materially increased the nut and hay yields. Lime-sulphur (1 in 40) controlled the fungi but damaged the foliage, so that production was not appreciably improved.

Woodroof (N[aomi] C.) & Higgins (B. B.). **Dusting Spanish Peanuts with sulphur.**—*Circ. Ga agric. Exp. Sta.* 117, 12 pp., 5 figs., 1939. [Abs. in *Exp. Sta. Rec.*, lxxxi, 4, p. 529, 1939.]

Satisfactory control of the *Cercospora* leaf spots of groundnut [*Mycosphaerella arachidicola* and *M. berkeleyii*: see preceding abstract] and increased yields were obtained in Georgia by three applications, at fortnightly intervals, in the early morning or late afternoon, beginning 60 to 65 days after planting, of 45 to 55 lb. per acre 325-mesh sulphur.

Humphrey (N.). **A Groundnut wilt disease on the coast of Kenya.**—*E. Afr. agric. J.*, v, 2, pp. 110–112, 1939.

In 1931, groundnuts of different varieties planted in observation plots in the coastal regions of Kenya wilted and died as a result of infection by a species of *Fusarium* [*R.A.M.*, xiii, p. 217]. The outer leaflets turned yellow, closed together, and collapsed, the affected plants then either dying off rapidly and completely, after shedding a great part of the foliage near the crown, or partially recovering and setting a small crop. The tap-roots of affected plants showed some rotting. The disease was also found in native gardens, and was clearly the limiting factor in the development of groundnut cultivation in the coastal areas. Of the varieties grown in the observation plots, only one, a creeping type from Nyanza, retained any healthy plants, about 40 per cent. of the plants of this variety ripening off normally. Selection work with this type has yielded some strains with high resistance. One other variety, a bunch type named Akola 10, is being retained for further trial.

Richards (M. C.). **Downy mildew of Spinach and its control.**—*Bull. Cornell agric. Exp. Sta.* 718, 29 pp., 4 figs., 6 graphs, 1 map, 1939.

Spinach downy mildew (*Peronospora spinaciae*) [*P. effusa*: *R.A.M.*, xviii, p. 275] is stated to be responsible for the annual failure of from 3 to 15 per cent. of the United States crop. In Nassau County, New York, annual losses are usually from 3 to 8 per cent. but may rise in some districts to 20, and entire plantings may sometimes be lost. During a study of this disease conducted from 1934 to 1938 the inoculation of 15 species from eight genera of the Chenopodiaceae and three species of *Amaranthus* with *P. spinaciae* entirely failed to produce infec-

tion, and it is believed that the host range of this pathogen is limited to the genus *Spinacia*. All the 35 commercial spinach varieties tested were equally susceptible to the disease, which is characterized by yellowing, stunting, and necrosis of the affected areas.

The causal agent differs morphologically from the downy mildews of other Chenopodiaceous plants. The history and systematic position of the fungus are reviewed. The name *P. effusa* (Grev.) Rabenh. is held to be incorrectly applied to the spinach mildew, as Rabenhorst studied a fungus on *Chenopodium* which Laubert in 1906 showed to be a distinct species [but see Art. B 54 of the International Rules of Botanical Nomenclature: ibid., xvi, p. 482]. The author accepts Laubert's name *P. spinaciae* for the mildew on spinach.

Overwintered infected plants were found to be the only important source of primary inoculum on Long Island, while susceptible weeds, infected and infested seeds, or infested soil seemed to be of no or little importance. Wind and rain were the chief agents of dissemination.

Conidial germination takes place only in the presence of free water. Age exerted a marked influence on germinability, conidia less than 1, 1, 2, and 3 days old showing, respectively, 53·4, 61·1, 16·0, and 0·1 per cent. germination in one test; in another 4·6 per cent. germination was observed in conidia 9 days old. The viability was greatly reduced by short periods of desiccation or exposure to sunlight. The optimum, minimum, and maximum temperatures for germination were found to be about 9°, 2°, and 27° C., respectively. Germ-tube elongation was greatest at 12° C. At temperatures of 60° to 65° F. infection took place in less than three hours after inoculation. The fungus required a relative humidity of 85 per cent. or above for fruiting; in greenhouses with relative humidities of 70 to 90 per cent. and temperatures of 60° to 75° fruiting never occurred before six days and in most cases the period was longer. Epiphytotics of the disease in Long Island were observed to depend on the combination of the following conditions: vigorous growth of plants at the time of inoculation, the presence of great numbers of conidia enabling many plants to be inoculated simultaneously, mean temperatures of 45° to 65° prevailing for a week or more, the presence of water on the leaves for periods of three hours or longer, and the maintenance of high relative humidities during infection and the fruiting of the fungus.

The application of copper oxide (cuprocide 54) at the rate of 1·75 lb. in 50 gals. water reduced the number of infected plants from 13·4 to 3·9 per cent., but produced slight injury. The isolation of overwintered spinach from winter and spring plantings is recommended for the control of the disease on Long Island.

Fumigation of Mushroom houses with hot formaldehyde gas from outside vaporizer for control of undesirable fungi.—*Agric. News Lett.*, vii, 8–9, pp. 77–78, 1939. [Mimeographed.]

An effective, economical method of fumigating mushroom [*Psalliota* spp.] houses consists in preparing the house for a new crop by thorough cleaning and washing with water or a solution of 4 per cent. commercial formalin (37 per cent.) in water, after which the house is carefully sealed and fumigated with formaldehyde gas. The gas is obtained

by vaporizing commercial formalin diluted with an equal quantity of water in a small boiler heated by oil or wood, set up outside the house, and connected with it by a 2 in. iron pipe. The house is then aired, the compost, pasteurized by high temperature fermentation, is laid, and the spawn planted. If *Mycogone* [*perniciosa*] develops, the affected areas can be controlled by sprinkling with 4 per cent. formalin. In the spawn plant the inoculating rooms are fumigated with formaldehyde, and all crates are dipped in 4 per cent. formalin before being used for the culture bottles. The fumigation dosage is one quart ($2\frac{1}{4}$ lb.) of commercial formalin to about 1,000 cu. ft. of space, and exposure lasts 24 hours.

Rui (D.). **Relazione sulle prove di lotta contro alcune malattie della Vite, effettuate nel 1938.** [An account of experiments in the control of some Vine diseases carried out in 1938.]—*Ric. sci. Progr. tec. Econ. naz.*, Ser. 2, x, 5, pp. 440–445, 1939.

Further experiments in 1938 at Conegliano, Italy, in the control of vine *Peronospora* [*Plasmopara viticola*] and *Oidium* (*Uncinula necator*) confirmed previous results as to the efficacy for this purpose of Prodotto d'Agostino (formula C) and cuprital [*R.A.M.*, xvii, p. 583], whereas copper borate was slightly less effective than Bordeaux mixture. The composition of Agostino C is given as 200 gm. each of copper sulphate, sodium hydrosulphide, and adhesive, and 500 gm. lime; formula B (200 gm. of each ingredient) gave slightly inferior results. Politional, a polysulphide adhesive, was added to cuprital at the rate of 400 gm. per hectol. in some of the tests with satisfactory results.

Summary of legislation affecting agricultural industries as at 31st December, 1938. Plant quarantine.—*Rep. agric. Dep. St Kitts-Nevis, 1938*, pp. 26–29, 1939.

By Statutory Rules and Orders No. 13 of 1938 the import of the following into St. Kitts-Nevis is forbidden: banana plants and parts thereof from all areas (against Panama disease [*Fusarium oxysporum* var. *cubense*] and root disease [? *Marasmius stenophyllus*]) but excepting fruit from the United States and other islands of the Leeward group; citrus fruits, plants and parts thereof from Cuba, Haiti, Santo Domingo, Puerto Rico, and the United States (against citrus canker [*Pseudomonas citri*] and other diseases); sugar-cane seedlings and plants, and all sugar-cane parts from all areas (against diseases at present unknown in the Presidency); plants growing in soil from all areas; and soil from all areas except the British Isles, Canada, the United States, and certain islands of the British West Indies.

Service and regulatory announcements. April–June, 1939.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 139, pp. 85–92, 1939.

Summaries are given of the plant quarantine import restrictions in force in Malta (amended), Rumania, St. Lucia, Venezuela, and New Guinea, together with a list of the declared plant diseases specified in the last-named country's Diseases of Plants Proclamation No. 1 of 18th June, 1938.

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WILSON (J. D.). **New equipment and new materials for controlling vegetable diseases.**—*Proc. Ohio Veg. Potato Grs' Ass.*, xxiv, pp. 110–134, 1939. [Abs. in *Exp. Sta. Rec.*, lxxxi, 5, p. 663, 1939.]

Experiments are described to determine the comparative efficiency in the control of certain vegetable diseases in Ohio of Bordeaux mixture and various insoluble copper compounds. Both 4–4–50 and 4–2–50 Bordeaux and coposil [*R.A.M.*, xviii, p. 785] caused considerable injury on young tomato plants. The stronger Bordeaux and Grasselli copper compound A were most effective against anthracnose [*Colletotrichum phomoides*] of the tomato canning crop [ibid., xviii, pp. 658, 725]. Postponement of spraying until leaf spot (*Septoria*) [*lycopersici*: ibid., xviii, p. 421] appeared gave fair control of the disease and augmented yields. Bacterial wilt of cucumbers [*Erwinia tracheiphila*: ibid., xv, p. 197] yielded more readily to mixtures containing an insoluble copper as an ingredient than to those lacking this element. In the case of muskmelons cupro-K gave the best results on the basis of saleable fruits. For economic reasons the substitution of insoluble coppers for Bordeaux mixture cannot be advocated, despite the fungicidal efficiency of the former, for the control of potato, bean [*Phaseolus vulgaris*], celery, and carrot diseases.

LARSON (R. H.) & WALKER (J. C.). **A mosaic disease of Cabbage.**—*J. agric. Res.*, lix, 5, pp. 367–392, 15 figs., 1939.

This is an expanded account of the authors' study on the extremely destructive cabbage mosaic in south-eastern Wisconsin, a preliminary report of which has already been noticed from another source [*R.A.M.*, xiv, p. 414; xvii, p. 426]. The disease is regarded as distinct from the cauliflower mosaic described by Tompkins [ibid., xvii, p. 6]. The first symptoms to appear are a slight yellowing and a clearing of the veins, usually beginning at the distal portion of the leaf, followed by mottling and more distinct vein-clearing. The later symptoms vary considerably. Commonly a slight veinbanding and savoying of the leaf lamina occurs. The normal production of leaf bloom is retarded, and as infected leaves become older, necrotic spots, usually 1 to 3 mm. in diameter, sunken, and blue-black, appear on or along the veins and in the parenchyma. The savoying of the interveinal tissue, usually a deeper green than normal, is often followed by twisting or curling of the midrib. In the field the symptoms are very varied and are often masked effectively. Growth may be stunted without any signs of

mottle or necrosis, and the outer leaves are inclined to be more erect and to clasp the head more tightly than is normal. Premature leaf drop is one of the most destructive phases of the disease. Less frequent is head necrosis, which develops at the maturity of the plant in the field or later in storage or transit, and is either confined to a few outer head leaves or scattered throughout the head. The necrotic spots are small, sunken, brown to black, and are most numerous in the interveinal tissue. In storage premature formation of the petiole absciss layer often renders the heads worthless for market.

Pieris rapae is recorded as an additional vector. *Brevicoryne brassicae* picked up the virus in 30 minutes and transmitted it to healthy plants after 30 minutes' feeding, the corresponding times for *Myzus persicae* being 1 hour and 30 minutes, respectively. The virus can also be transmitted mechanically with the aid of carborundum as an abrasive. Drying inactivates the virus. The disease is most severe at temperatures of 24° to 28° C., within which range stunting and necrosis occur, but no symptoms develop on new foliage of infected plants held at 16° or lower. Overwintered infected cruciferous weeds are an important source of inoculum.

RODIGHIN (M. [N.]). О редкой болезни Тыквы и Кабачков, вызываемой **Ascochyta citrullina (C. O. Smith) Gross.** [On a rare disease of Vegetable Marrow and Italian Marrow, caused by *Ascochyta citrullina* (C. O. Smith) Gross.]—'25 years Saratoff Agricultural Institute', Saratoff, pp. 191–194, 1939.

Ascochyta citrullina (the conidial stage of *Mycosphaerella citrullina*) [*R.A.M.*, xiv, p. 182] was observed in 1935 causing a blackening and wilting of the fruits of vegetable marrow and Italian marrow in fields near Saratoff. This is the first record of this fungus in the U.S.S.R.

BRANAS (J.). **Chronique. Sur le congrès de Bad-Kreuznach.** [Current notes. On the Congress of Bad-Kreuznach.]—*Progr. agric. vitic.*, cxii, 37, pp. 202–204, 1939.

At the international congress of viticulture held at Bad-Kreuznach in 1939, F. Stellwaag, A. Jöhnssen, and J. Branas agreed that the disease known in Germany as 'reisigkrankheit' is identical with court-noué as understood at Montpellier and defined by Ravaz [*R.A.M.*, xviii, p. 652].

Objections to the author's view [that the disease is of virus origin and is transmitted mainly by *Phylloxera vastatrix* f. *radicicola*] were raised by Faës of Lausanne and Börner of Naumburg a.d. Saale. The former pointed out that the simultaneous appearance of the disease over large areas is incompatible with insect transmission, which is necessarily slow; he also expressed the view that subterranean biting insects cannot act as vectors of filterable viruses. The latter stated that the insects do not readily leave a root once established on it, and therefore can hardly be responsible for transmission. The author contends, however, that the disease can be spread by the vines themselves, that no proof is forthcoming of the alleged inability of the insects to act as vectors, and that they do in fact leave the roots when these are cut or dug up.

MARSAIS (P.) & SÉGAL (L.). **Le court-noué contagieux a-t-il les caractères d'une maladie à virus?** [Has contagious court-noué the characters of a virus disease?]—*Rev. Vitic., Paris*, xci, 2, 360, 2361, pp. 257–264, 1939.

The authors state that they regard vine court-noué [see preceding abstract] as a degeneration disease. The shortening of the internodes is the outward manifestation of a physiological unbalance which may be caused by widely different physical, chemical, or pathogenic agencies. This symptom may be accompanied by bushiness of the shoots (reisigkrankheit), leaf denticulation (roncet), chlorotic leaf mottle (mosaic), black striation of branches and leaves (mal nero), and pith decomposition (pith disease). In other words, court-noué is not so much a disease as a symptom.

With regard to the suggested virus origin of court-noué, the authors consider this hypothesis is unsupported by a single experimental fact. Some of the symptoms, it is true, resemble those of a virus disease, but the presence of the endocellular cordons would not indicate a condition of this nature. The view that the disease is not present in localities where *Phylloxera* [*vastatrix* f. *radicicola*] is rare or absent, such as vineyards subject to flooding [*R.A.M.*, xvii, p. 793], is not supported by the authors' observations, which showed the disease to be characteristically present in an ungrafted vineyard near Narbonne subject annually to flooding. The authors conclude that court-noué is probably caused by some parasite in the tissues or pith that has so far escaped observation.

BARRETT (J. T.). **Overwintering mycelium of Plasmopara viticola (B. & C.) Berl. & De T. in the California wild Grape, Vitis californica Benth.**—Abs. in *Phytopathology*, xxix, 9, pp. 822–823, 1939.

The mycelium of *Plasmopara viticola* is stated regularly to overwinter in the cortical tissues and cane buds of *Vitis californica* in California, thereby perpetuating infection by downy mildew. Shoots arising from diseased buds are noticeably more vigorous than those from non-infected (up to 2½ times longer and twice the diameter at the base), with abnormally pale leaves and stems. The mycelium can easily be detected microscopically in the parenchyma of all organs, even to the very tips of the growing points. In nature sporangiophores have been observed only on the leaves, where they first appear along the veins on the under side. Except for the foliage, the infected parts are seldom killed. The leaf spots due to secondary infection are scattered at random, rapidly turning first yellow and then brown. Cultivated grapes, even in close proximity to diseased wild ones, do not seem to contract downy mildew from this source.

SMALL (T.). **Report of the Mycologist.**—*Rapp. aux États de Jersey, 1938*, pp. 21–35, 1939.

This report [cf. *R.A.M.*, xvi, p. 514; xvii, p. 621] contains, among others, the following items of interest. During 1938, potato blight (*Phytophthora infestans*) was almost entirely absent. When freshly dug, healthy potatoes were inoculated with a spore suspension of *P. infestans* and covered with soil in the ridges among the crop, 22 out of 30 were

diseased four days later, though infection was not conspicuous enough to be detected in ordinary digging; seven days after inoculation 29 showed advanced infection. In another test, no disease was apparent three days after inoculation, while after six days, 16 out of 30 tubers were diseased, only five of which would ordinarily have been detected. These results indicate how long to postpone digging a diseased crop [after killing the haulm] in order that infected tubers may be recognized and discarded when dug.

In Jersey, *Corticium solani* is very prevalent on seed potatoes, but seldom causes enough loss to deserve attention. In 1938, however, when exceptionally dry weather prevailed, two serious outbreaks occurred, involving the loss of five vergées of early potatoes.

Tomato stem rot (*Didymella lycopersici*) [ibid., xvi, p. 514] caused heavy losses in several fields. In one instance, the total value of the crop from 10,000 plants was 8*s*., and in another 30,000 plants yielded only 12½ tons. In several instances plants raised in sterilized soil became infected when planted out in fields not previously planted to tomatoes. In experiments on seed transmission [ibid., xviii, p. 636], seed from diseased fruits and seed inoculated with the fungus occasionally yielded a diseased seedling. Experimental evidence showed that the spores are carried by wind and rain and on pruning knives, and that the fungus may spread slowly through the soil. Seedlings were much less prone to attack than field crops. On outdoor crops, at least one month (often two months) elapsed between inoculation and wilting. The fungus remained viable for nine months on tomato stems stored out of doors.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1938.** [Review of phytopathological records noted in 1938.]—*Boll. Staz. Pat. veg. Roma*, N.S., xix, 2, pp. 115–188, 16 figs., 1939.

This report [cf. *R.A.M.*, xvii, p. 727] contains numerous items of phytopathological interest, of which the following may be mentioned. Apple fruits were attacked by *Sclerotinia fructigena* [ibid., xvi, p. 230] and those of quince by *S. linhartiana* [ibid., xvii, p. 589], young peach trees (at the collar) by a *Phytophthora* probably very close to *P. cactorum* [cf. ibid., xv, p. 34], and young walnuts by *P. cambivora* or a fungus closely allied to it [ibid., xvi, p. 588]. *Pinus pinaster* was widely infected by *Peridermium cornui* [ibid., xviii, p. 73]. Favoured by exceptional weather conditions, *Dothichiza populea* [ibid., xvii, p. 728] caused heavy losses to poplars, mortality reaching 95 per cent. on Canadian poplars in one locality, while in another an entire grove of two-year-old trees succumbed to infection. Pyramid and black poplars [*Populus pyramidalis* and *P. nigra*] were also affected.

Treatment of wheat seed-grain against bunt (*Tilletia tritici*) [*T. caries*] with a proprietary powder, 'germinol', showed that it was much less active fungicidally than Caffaro powder, but it markedly stimulated seed germination.

Saccharine sorghum in the provinces of Ferrara and Padua was attacked by *Sphacelotheca sorghi* [ibid., xviii, p. 517], and a *Sclerotium* causing a collar rot of the same host in Sicily was identified by Whetzel as *S. delphinii* [loc. cit.]. *Onobrychis sativa* was severely infected by *Placosphaeria onobrychidis*. Cucumbers at Brindisi and Bari were in-

fected by *Fusarium semitectum*, and artichokes (*Cynara scolymus*) near Rome by *Ramularia cynarae* [ibid., xvii, pp. 71, 217]. Beets developed a dry rot due to *S. rolfsii* [ibid., xvii, p. 643]. Tobacco at Ravenna showed infection by *Alternaria longipes* [ibid., xviii, p. 373].

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 9, pp. 489–493, 5 figs., 1939.

During the last three seasons the application of very weak Bordeaux sprays has been found to give as good control of black spot of Valencia oranges [*Phoma citrocarpa*: *R.A.M.*, xviii, p. 794] in New South Wales as strong ones, without causing any appreciable damage. Consequently two alternative spray programmes are recommended: (a) Bordeaux $1\frac{1}{2}$–$1\frac{1}{2}$–80 applied at blossoming and then 5, 10, and 15 weeks after the first spray; or (b) Bordeaux 2–2–80 applied at blossoming and then 6 and 12 weeks after the first spray.

Several cases of leaf-yellowing and stunting of lettuce plants are reported from the Sydney area. The affected plants showed chlorotic areas between the veins and along the margins of leaves and failed to form hearts of marketable size. The condition is believed to be caused by soil acidity associated with a deficiency of magnesium or calcium, or both. In field tests at the Hawkesbury Agricultural College the condition was almost completely controlled by the addition to the soil of dolomite or lime at the rate of one ton per acre prior to planting.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 10, pp. 554–558, 6 figs., 1939.

In some areas of New South Wales glasshouse tomatoes are widely affected by *Bacterium solanacearum* [*R.A.M.*, xviii, pp. 279, 422]. The disease has been present in the State, chiefly on outdoor tomatoes, potatoes, and tobacco, for 45 years. In most seasons it is not an important cause of reduced yields in tomatoes, but when an outbreak does occur it presents a somewhat difficult problem, not only because the affected plants die, but also because spread readily takes place during pruning, and the soil becomes contaminated. Loss on one property recently amounted to 20 per cent. of the crop. The disease is transmitted by chewing insects and by workers' hands. It is usually most serious on sandy soils and flourishes at high temperatures (about 95° F.) and under wet conditions. Control consists in selecting seed from healthy crops, seed treatment with mercuric chloride ($\frac{1}{4}$oz. to $12\frac{1}{2}$ pints water for 10 minutes), formalin disinfection of the seed-beds, steam sterilization of soil in glasshouses, crop rotation in outdoor beds (Solanaceous plants being excluded for at least three years), removal and burning of all affected plants, and washing the hands in warm, soapy water after handling diseased plants.

Peach and nectarine varieties in the coastal districts, if apt to develop freckle [*Cladosporium carpophilum*: ibid., xviii, p. 785], should be sprayed with lime-sulphur at intervals of three to four weeks, beginning in the first week of October and ending eight or nine weeks before normal harvesting for the variety concerned. Varieties ripening near the new year thus require only two spray applications, while for those ripening later a further spraying is necessary. The spray should consist of lime-

sulphur (0·125 per cent. W/V [ibid., xviii, p. 655], equivalent to 1 gal. concentrate to 160 gals. water). Colloidal sulphur 2 lb. per 80 gals. is an effective substitute. With either material a spreader should be used. After spraying for three consecutive seasons, the programme may safely be omitted for one.

Thirteenth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1938–1939.—134 pp., 2 graphs, 1939.

On pp. 28–31 of this report G. H. CUNNINGHAM states that *Phoma lingam* [*R.A.M.*, xix, p. 58] was isolated from moist soils in New Zealand two months after the removal of infected swedes and turnips, but was not recovered after a further period, demonstrating that the fungus does not long persist in the soil unless associated with plant tissues. Plants sprayed with Bordeaux mixture before being inoculated with the spores of the fungus remained unaffected. It would appear, therefore, that Bordeaux mixture may prove effective in protecting *Brassicae* grown for breeding and experimental purposes.

Of 11 newly introduced field pea varieties tested, one was immune from mosaic. Onion yellow dwarf [*Allium* virus 1: ibid., xviii, p. 704] was recently found in the Marshland district, its virus origin being proved experimentally. A new wilt of tomatoes, due to *Phytophthora cryptogea* [ibid., xvii, pp. 181, 585], was recorded on seedlings obtained from a Timaru glasshouse; four days after inoculation, plants wilted and collapsed near ground level. Tomato bacterial wilt (*Aplanobacter michiganense*) [ibid., xviii, p. 421] was recently observed for the first time in New Zealand. Gooseberries from Greytown were attacked by stem wilt due to *Verticillium dahliae* [ibid., vii, p. 179], a fungus hitherto recorded only on tomatoes in New Zealand.

In the section of this report dealing with fruit research and cold storage (pp. 70–75) it is stated that leaf symptoms of mottle leaf on oranges and lemons were suppressed (but only for the immediately following growth-cycle) by one spray application of manganese sulphate and hydrated lime [ibid., xviii, p. 103].

Gloeosporium perennans, hitherto recorded only on apple branches in New Zealand [cf. ibid., xvi, p. 688], was isolated from pear blossom buds at Auckland.

In a small-scale test the use of 'copperized' paper wraps (standard, commercially prepared samples) reduced contact-spread of grey mould (*Botrytis* sp.) in Winter Cole pears during seven months storage to a low figure, though control fruits in untreated paper became completely infected.

Jonathan apples from trees to which applications of potash had been made [cf. ibid., xviii, p. 235] were again more resistant to breakdown, fungal infection, and superficial scald during prolonged storage than apples of the same variety from untreated trees.

SETH (L. N.). **Report of the Mycologist, Burma, Mandalay, for the year ended 31st March, 1939.**—6 pp., 1939.

The following are among the items of interest in this report [cf. *R.A.M.*, xviii, p. 155]. During 1938, infection of rice by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] on Kanhalu farm, Mandalay,

was very slight, whereas in cultivators' fields in the vicinity, infection was very severe, possibly owing to the inadequate water supply.

Sorghum seed soaked in water for four hours during one morning in summer and then dried in the sun for six and four hours showed, respectively, 4·4 and 6·6 per cent. infection by *Sphacelotheca sorghi* [cf. ibid., xiv, pp. 22, 156], as compared with 8·5 per cent. infection in the untreated control. Better results would probably be obtained in April or May when the temperatures in the sun are higher.

All wheat-growing areas reported heavy losses from *Puccinia graminis*, while *P. glumarum*, widely present the year before, was not found.

Betel vine (*Piper betle*) mildew, caused by a species of *Oidium* [ibid., xviii, pp. 156, 437], was moderately serious in most localities; in one experiment, spraying the plants with a 0·5 suspension of 'ialine' colloidal sulphur reduced infection from 17·96 to 10·35 per cent. after one month, whereas in the unsprayed control plot infection rose from 17·27 to 44·78 per cent. Betel vines treated against foot rot (*Phytophthora colocasiae*) [ibid., xvii, p. 587] by an application of 1 per cent. Bordeaux mixture made at the time of pulling down for renovation and once a month afterwards for four months showed 2·8 per cent. infection, as against 22·8 per cent. in the controls.

The edible straw mushroom (*Volvaria diplasia*) continued to be popular among growers, 634 bottles of spawn being issued, as against 514 the year before. Improved yields were given when the beds were watered with 2 gals. water morning and evening in dry periods. In five experiments yields were increased, as compared with untreated beds, by the addition to the beds of ground seed of pigeon pea or chick pea, production also being much earlier in the treated than in the untreated beds. The *Corticium* disease [ibid., xviii, p. 156] again appeared, but was controlled by spraying with 4 per cent. formalin solution. On the Kanhalu farm this disease completely inhibited mushroom production. *Cystopus candidus* [ibid., xviii, p. 655] is recorded for the first time for Burma on *Brassica campestris* [an oilseed crop] from two localities.

NATTRASS (R. M.). **Annual Report of the Senior Plant Pathologist.**— *Rep. Dep. Agric. Kenya, 1938*, ii, pp. 42–47, 1939.

Of 18 samples of wheat stem rust [*Puccinia graminis*] tested in Kenya during 1938 by F. W. Evans, 14 were form K5 [*R.A.M.*, xviii, p. 439], one sample was a mixture of K3 and K5 in which the former predominated, and the remaining three were form K2. Forms K1 and K4 were not recorded during the year. A sample received from Uganda belonged to form K2. Of three samples collected in Tanganyika in June, K4 was present on two and K3 on the third, while of three others found in August, also in Tanganyika, one was a mixture of K3 and K4, the second was K4, and the third K5.

Fungi found on passion fruit for the first time in Kenya included *Alternaria passiflorae* [ibid., xviii, p. 235], causing leaf spot but shown experimentally to be able to infect the fruit, and *Septoria fructigena*, isolated from the fruit, and shown by artificial inoculations readily to cause lesions on leaves and fruit. Golf greens of *Cynodon dactylon* were affected by brown patch due to *Helminthosporium cynodontis*. *Sclerotinia minor* [ibid., xvii, p. 128] was isolated from pyrethrum [*Chrysan-*

themum cinerariaefolium), a root rot and wilting of which were probably due to this fungus. A severe leaf-splitting of *Phoenix reclinata* was caused by *Exosporium palmivorum* [ibid., ix, p. 64].

Rapport annuel pour l'exercice 1938 (Ire partie). [Annual report for the year 1938 (1st part).]—*Publ. Inst. nat. Étud. agron. Congo Belge*, 269 pp., 35 figs., 2 graphs, 1 map, 1939.

This report contains, *inter alia*, the following items of phytopathological interest. Sweet potatoes are somewhat severely infected by *Alternaria solani* in the part of the Belgian Congo bordering on Uganda, but the damage caused is much less than in the vicinity of Rutshuru. The fungus causes serious defoliation of potatoes also.

Citrus at N'Dele is attacked by a bacterial leaf disease due either to *Bacterium* [*Pseudomonas*] *citri* or another organism inducing the same symptoms. The leaves and inflorescences of mangoes are attacked by *Bact. mangiferae*. Infection of coffee roots by a species of *Rigidoporus* and *Pseudococcus citri* is favoured by faulty cultural methods. Old *Hevea* rubber stumps are important sources of infection by the fungus. The spraying of coffee with a suspension of the spores and mycelium of *Beauveria bassiana* [*R.A.M.*, xviii, p. 735] gave positive results against *Stephanoderes* [? *hampei*].

Sclerospora sorghi was noted on *Sorghum arundinaceum* and *Sorosporium reilianum* on sorghum. Oil palms were infected by *Delortia palmicola*, a species of *Ascochyta* (on the leaves of seedlings in a nursery), and *Ganoderma applanatum*. *Cinchona ledgeriana* at Nioka showed the presence of *G. pseudoferreum* and *Corticium salmonicolor* [ibid., xviii, p. 729].

The organism causing cotton wilt at Bambesa was identified at Baarn as *Fusarium vasinfectum* f. 1 [ibid., xviii, p. 797]. Other fungi attacking cotton were *Alternaria macrospora* and *Rhizoctonia* [*Corticium*] *solani*. At Gandajika infection of cotton by *Nematospora* [*coryli* and *N. gossypii*: loc. cit.] averaged 22 per cent. Evidence was obtained that the disease (stigmatomycosis) can be transmitted by *Antestia cincticollis*.

Belgrave (W. N. C.). **The Division of Plant Pathology.**—*Rep. Dep. Agric. Malaya, 1938*, pp. 69–73, 1939.

Most of the information given in this report has already been noticed from another source [*R.A.M.*, xviii, p. 503]. The smooth Cayenne or Sarawak pineapple is stated to be very susceptible to fruitlet brown rot [ibid., xvii, p. 192], the yellow bacillus associated with the disease [resembling *Erwinia ananas*] being most commonly isolated from diseased fruits of this variety. Observations on fruits from two adjacent plots showed that whereas 12 per cent. of the fruits of the Singapore canning variety were only lightly affected, 80 per cent. of the Sarawak fruits were so heavily diseased as to make most of them unfit for canning or consumption. The yellow bacillus grows scantily on cultural media below P_H 4·0, and it is of interest to note that the juice of the Singapore fruits was considerably more acid (P_H 3·85) than that of the Sarawak (4·5).

Young areca palms in the Province Wellesley were attacked by a hitherto unobserved form of stem rot causing on the young, green

stems brownish lesions which were black beneath. The diseased tissue yielded predominantly *Nigrospora sphaerica.*

Reichert (I.). **Palestine : diseases of field crops.**—*Int. Bull. Pl. Prot.*, xiii, 9, pp. 204–210, 1939.

A preliminary list is given of diseases observed on field crops (mainly grasses and cereals) in Palestine from 1923 to 1938, and studied at the Agricultural Research Station, Rehovoth.

Israilski (V. P.) & Chistoserdova (Mme G. V.). Серологические исследования растений, пораженных бактериальными болезнями. [Serological examination of plants affected with bacterial diseases.]—*Микробиол.* [*Microbiol.*], viii, 1, pp. 101–115, 1939. [English summary.]

In further studies in Moscow on the possibility of applying serological tests for the diagnosis of bacterial diseases [*R.A.M.*, xviii, p. 445], extracts from the rind of lemon fruits and branches of lemon trees infected with *Bacterium* [*Pseudomonas*] *citriputeale* gave a precipitate with rabbit sera immunized against this organism, whereas extracts from healthy plant material gave none; none of the extracts gave any precipitate with normal rabbit sera. Similar results were obtained in analogous tests with *Bact. mori.* A few normal sera gave precipitates with extracts from healthy plants, e.g. cotton, possibly owing to the presence of some pseudo-antibodies, and it is, therefore, of importance only to prepare immune sera from rabbits whose normal sera do not react in this way. Extracts from branches of lemon trees naturally infected with *P. citriputeale* failed to precipitate, however, with sera immunized against strain 'lemon 25' of this organism, and a biochemical and serological examination of three out of the 15 strains isolated from these branches showed them to differ from strain 'lemon 25' in various respects. Similar tests with beans and *Bact. xanthochlorum* (strains 69 and 77) also demonstrated that the precipitation reaction is specific, and takes place only when the sera used are immunized against a strain of bacterium serologically identical with, or closely related to, that present in the infected plant. Extracts from tomato and sunflower galls caused by *Bact. tumefaciens* gave very small precipitates with sera immunized against the same strain of the organism, and this is held to substantiate the observations of earlier workers that the galls contain only very small numbers of bacteria.

Riker (A. J.) & Baldwin (I. L.). **The efficiency of the poured plate technique as applied to studying bacterial plant pathogens.**—*Phytopathology*, xxix, 10, pp. 852–863, 1939.

The ordinary poured-plate technique is considered to be open to various objections from the standpoint of critical bacteriological studies, among its defects being the development of many of the colonies from bacterial clumps rather than single cells, the confluence of a large number of colonies in the commonly employed dilutions, and the occasional failure of dilution plates to separate important plant pathogens. One of the best modifications of the standard method consists in allowing the culture destined for purification to reach the 'logarithmic growth

phase', which in the case of many plant pathogens occurs in 12 to 24 hours at 24° C.; pellicle and sediment commonly appear after 36 to 48. Successive dilutions are then made in several lots of a suitable liquid medium and mixed with melted and cooled agar in Petri dishes. Colonies are selected for transfer from plates with a small number only and examined under magnification for any evidence of contamination. The probability of coalescence, which is greater the larger the number of colonies per plate, and the more considerable their dimensions, has been estimated by a statistical method. This line of approach may also be usefully applied to bacterial plate counts and to the local lesion method for the study of plant viruses. Though single-cell isolations give greater assurance of purity of cultures than even well-adjusted dilution plates, both methods have certain advantages and may be regarded as complementary.

SPRAGUE (R.). **Soil-borne cereal diseases in coastal Oregon.**—*Northw. Sci., Wash.*, xii, 4, pp. 74–80, 1938. [Received November, 1939.]

Hay oats, the chief cereal crop in the coastal area of Oregon, are liable to attack by a number of fungi thriving in the acid (P_H 4·8 to 5·3) soils of the region. The most serious disease observed since 1930 is a foot rot caused by *Fusarium culmorum*, which is also found on wheat, spelt, and barley, but more or less severe damage is inflicted by the red leather leaf disease (*Pseudodiscosia avenae*) [*R.A.M.*, xv, p. 572], *Helminthosporium avenae* [ibid., xvii, p. 809, *et passim*] (especially on the Red Algerian, Kansta, and Red Rustproof semi-winter-hardy varieties), *H. sativum*, *Rhizoctonia* sp., *Septoria tritici* [ibid., xviii, p. 297], and *Ophiobolus graminis*. Other hosts of *H. sativum*, *R.* sp., and *O. graminis* in the coastal region are wheat, spelt, and barley. In inoculation experiments *R.* sp. also gave positive results on *Lolium perenne*, *L. multiflorum*, *Holcus lanatus*, *Bromus rigidus*, *Festuca myuros*, and vernal emmer.

Generally speaking, winter cereals are not adapted to the lighter coastal soils, though Oregon Gray (Winter Turf) and Support oats may be grown in certain districts. Fulhio wheat will yield an adequate grain crop, but most other wheat and all barleys are mainly unproductive. The Alstroum and Bearded and Red Winter spelts are well adapted to local conditions. Spring-sown oats vary in their reaction to *Fusarium* root rots; Anthony, Eclipse, Green Mountain, Hawkeye, Minrus, and Rusota were comparatively resistant in these observations, which require amplification, however, for the determination of the best varieties for cultivation. Schoolmam, an oat variety grown primarily for grain, is somewhat susceptible to foot rots though resistant to crown rust [*Puccinia coronata*], and should be replaced if varieties resistant to both diseases are developed.

MATHENY (G. E.). **A summary of the cereal rust situation in Virginia in 1938 with notes on other cereal diseases.**—*Plant Dis. Reptr Suppl.* 115, pp. 41–49, 1 map, 1939. [Mimeographed.]

A cereal rust survey carried out in Virginia in 1938 showed that both stem rust (*Puccinia graminis*) of wheat, barley, oats, and rye, and leaf rusts (*P. triticina*, *P. dispersa*, and *P. anomala*) of wheat, rye, and barley,

respectively, appeared exceptionally early, evidently largely owing to unusually favourable moisture and temperature conditions for growth during the early part of the season, which was about two weeks advanced in April. A direct correlation was found to exist between temperature and moisture conditions in April, May, and June, and the dates of appearance of various stages of the rusts on their host plants in the years from 1934 to 1938, inclusive. A considerable reduction in the amount of stem rust infection in wheat was observed in fields where barberries had been eradicated.

WINKELMANN (A.) & RANCK (G.). **Untersuchungen über die Lagerfähigkeit von kurznassgebeiztem Getreide.** [Investigations on the suitability for storage of seed-grain disinfected by the short liquid method.]—*Tech. in. d. Landw.*, xx, 9, pp. 191–193, 1939.

A tabulated account is given of the writers' laboratory experiments at a Westphalian agricultural seed-producing establishment on the effects of the so-called 'short disinfection process' [*R.A.M.*, xvii, pp. 100, 509, *et passim*] on the seed-grain of three barley varieties, three samples of Petkus rye and two each of Carsten's V, Strube's Squarehead, and Heine's III wheat, with special reference to any modifications calculated to impair its suitability for storage. Two preparations, designated A and B, were used at normal (3 l. per 100 kg.) and excess (4 l.) concentrations. The treated material was germinated in sand at a temperature of 15° C., falling to 10°. The outcome of the tests showed that the seed-grain treated at the normal strength could be stored for periods of up to six weeks without risk of deterioration. Susceptibility to excess concentrations varied in the different varieties and samples.

LEUKEL (R. W.) & NELSON (O. A.). **Chlorine gas as a seed disinfectant.**—*Phytopathology*, xxix, 10, pp. 913–914, 1939.

A preliminary account is given of laboratory experiments on the use of chlorine as a seed disinfectant. Exposure for two hours to a concentration of only 1 per cent. chlorine gas by volume completely inhibited the germination of barley covered smut [*Ustilago hordei*] and sorghum covered kernel smut [*Sphacelotheca sorghi*] under certain [unspecified] conditions. Wheat bunt [*Tilletia caries* and *T. foetens*] was effectively combated by two hours' exposure of the seed-grain to 3 to 9 per cent. chlorine gas, while *S. sorghi* succumbed to 10 per cent. after one hour. The smuts of oats [*U. avenae* and *U. kolleri*] and barley [*U. nuda*], however, were not appreciably weakened by the subjection of the seed-grain to a 10 per cent. strength for two hours. In general, the results of the tests showed that to ensure the elimination of superficial seed-borne spores without injury to the seed-grain, the time of exposure should range from one to two hours, the gas concentration from 3 to 9 per cent., and the volume of pure gas from 20 to 40 per cent. of the net volume of the seed-grain.

SMITH (R. W.). **Grasshopper injury in relation to stem rust in spring Wheat varieties.**—*J. Amer. Soc. Agron.*, xxxi, 9, pp. 818–820, 1939.

With some exceptions, wheat varieties severely damaged by stem rust [*Puccinia graminis*] in a very destructive epidemic in North Dakota in

1938, sustained considerably more injury from grasshopper (*Melanoplus mexicanus*) attacks than those only slightly affected [*R.A.M.*, xix, p. 9]. The incidence of grasshopper infestation on five varieties showing 75 per cent. rust (Reward, Reliance, Red Fife, Marquis, and Supreme) ranged from 60 to 95 per cent., but was only 20 per cent. on Hope and Pilot (2 per cent. rust).

NEWTON (MARGARET) & JOHNSON (T.). **A mutation for pathogenicity in Puccinia graminis tritici.**—*Canad. J. Res.*, Sect. C., xvii, 9, pp. 297–299, 1939.

In the course of a study on *Puccinia graminis tritici* in Canada, a pathogenic change was observed in a uredo culture of race 52 of the fungus, which had previously remained constant in pathogenicity for nearly two years in storage, the possibility of contamination being excluded. This change, which can only be explained on the assumption of mutation, first became manifest following a six months' storage of the original culture on wheat in the refrigerator at a temperature of about 8° C., when race 52 appeared to be largely replaced by another race. Stored for a further period of four months the original culture gave rise to a pure culture of the new race with no traces of race 52 left. The new race proved to be one hitherto undescribed, and has been given the number 178.

LATHBURY (R. J.). **Annual Report of the Plant Breeder.**—*Rep. Dep. Agric. Kenya, 1938*, ii, pp. 52–59, 1939.

During 1938, form K5 of wheat stem rust [*Puccinia graminis*: see above, p. 71] was present throughout Kenya, even at an altitude of 9,000 ft., but on the whole did not cause serious damage, though certain localities at the lower elevations suffered severely. The new wheat, No. 58, was again badly affected [*R.A.M.*, xviii, p. 439].

Kenya Governor, Equator, and Golden Ball wheats were found to be less susceptible to form K5 than were most of the varieties grown in Kenya, while Sabanero was generally resistant. Variety No. 117A (Njoro Hybrid × Marquis) has so far shown complete resistance to form K5, and is, in fact, resistant to all forms, though least so to K3. Two strains of Double Cross × Ceres 721 selected in 1937 were completely resistant to K5. Reliance wheat, susceptible to K3, was resistant to K5, and should be useful as long as K3 does not appear in an epidemic form. Australian 26 A (Kenya Standard × Baringa × Nabawa × Wandilla) has shown resistance to K5 in the field.

In some districts, early sown wheat, owing to wet conditions at flowering and when the grain was filling, was again affected by black chaff [*Bacterium translucens* var. *undulosum*: ibid., xviii, p. 665] and glume blotch [*Septoria nodorum*: ibid., xvi, p. 733]. Take-all [*Ophiobolus graminis*: ibid., xv, p. 483] was still present in some wheat fields, but on the whole caused no serious trouble.

STRAIB (W.). **Die Faktorenbeziehungen im Verhalten des Weizens gegen verschiedene Gelbrostrassen.** [Factorial relations in the reaction of Wheat to different races of yellow rust.]—*Z. indukt. Abstamm. u. VererbLehre*, lxxvii, 1, pp. 18–62, 2 figs., 1939.

A detailed, fully tabulated account is given of the writer's experi-

mental studies at the Gliesmarode (Brunswick) branch of the Biological Institute on the co-operation of the genes determining the reaction of wheat to different physiologic races of yellow rust (*Puccinia glumarum*) [*R.A.M.*, xviii, p. 734]. For this purpose a white spelt possessing high and constant resistance to all the races so far differentiated was crossed with the Strube's and Carsten's V Squareheads, Spalding's Prolific, Heine's Club, and Peragis, which in turn were crossed among themselves; crosses were further made between other varieties. The progeny of eleven crosses was studied in the greenhouse and that of five in the field.

The resistance of the white spelt proved to be of a monomerous-dominant order in relation to the susceptibility of the various commercial varieties, and monomerous-recessive in respect of absolute freedom from infection shown by certain commercial sorts. The latter character and susceptibility of the *vulgare* parents were found to be conditioned by the same pair of allelomorphs, while the resistance of the white spelt to the various races tested (1, 2, 5, 7, 9, 15, 20, 26, 35, and 37 in the greenhouse; 2, 7, and 9 in the field) was also transmitted to its offspring by means of one and the same genetic factor. The different crosses within the *vulgare* wheats obeyed similar laws, freedom from infection being invariably monomerous-dominant, while this character and resistance to certain races were governed to some extent by the same factors.

Some evidence was forthcoming that reaction to yellow rust in some of the crosses is dependent on the operation of allelomorphs belonging to a multiple series, while the complex relationships in certain hybrid progenies point to plurifactorial inheritance. Summer susceptibility predominated over summer resistance in the material under observation. In two instances the segregation ratios in the F_2 indicate a monohybrid inheritance of summer resistance, while in other crosses the F_3 and F_4 segregation procedure was suggestive of a polymerous origin for this character. The factors conferring summer resistance to a given physiologic race appear to be similarly active in respect of others, just as the factors for absolute resistance in the seedling stage are probably correlated with those for relative and summer resistance. On the other hand, no connexion could be traced between the genes for yellow rust resistance and the ear characters of spelt.

BECKER (HANNA) & HART (HELEN). **Das Auftreten und die Verbreitung von Gelbrost in Ostharz und den daran angrenzenden Weizenanbaugebieten.** [The occurrence and distribution of yellow rust in the eastern Harz and adjoining Wheat-growing districts.]—*Z. PflKrankh.*, xlix, 7–9, pp. 449–481, 4 maps, 1939.

A comprehensive, tabulated account is given of the writers' studies in 1937–8 on the occurrencé and distribution of yellow rust of wheat (*Puccinia glumarum*) in the eastern Harz mountains, Germany [*R.A.M.*, xviii, p. 512], a wheat-growing region where a number of different climatic conditions prevail in a comparatively restricted area. A heavy rainfall (mean of 600 to 800 mm. per annum) and low average temperature (7° C.) were found to be prerequisite conditions for the development of rust, but even where these are fulfilled the disease can only thrive on impermeable soils affording a plentiful water supply for

vigorous plant growth. On the other hand, the adverse influence of dry, warm climates may be counteracted by the localized moisture of a river valley or other low-lying site, permitting the development of a restricted epidemic. Another factor impeding the full scope of yellow rust is the cultivation of locally resistant varieties, though where such resistance is only partial young plants may contribute to the spread of infection by acting as a source of spring inoculum for neighbouring stands of susceptible varieties. All things considered, it may be concluded that a really destructive outbreak of *P. glumarum* is only possible when the partnership between host and pathogen admits of the free growth of the latter unhampered by environmental factors [ibid., xvi, p. 371]. No variety is completely resistant to all races under all conditions, and the exclusive cultivation of a given resistant variety may facilitate the multiplication of a specific physiologic race, thus entailing a certain risk, but at the same time the existence of such varieties is a valuable safeguard against the indiscriminate spread of the rust.

Since *Agropyron caninum* proved to be susceptible in greenhouse inoculations to various physiologic races of yellow rust from wheat, barley, and grass, and was further found infected by race 6 from wheat in the open, it is considered very probable that the grass serves as a source of supply of uredospores during the unfavourable months of July and August, and later for the winter crops sown in October to November. In this connexion it should be remembered that the grass (*Triticum* [*A.*] *repens* and *A. caninum*) rusts can also attack barley, being particularly severe on the Granat variety, which suffers heavy damage from *P. glumarum* in the foothills of the Harz mountains.

PRIDHAM (J. T.). **A successful cross between Triticum vulgare and Triticum timopheevi.**—*J. Aust. Inst. agric. Sci.*, v, 3, pp. 160–161, 1 fig., 1939.

The author reports successful crossing in New South Wales between *Triticum timopheevi* [*R.A.M.*, xv, p. 352], reputedly resistant to *Puccinia graminis* and *P. triticina*, and Steinwedel wheat, several promising fifth-generation lines from this cross being fixed for apparent immunity.

MONTEMARTINI (L.). **Dieci anni di osservazioni sopra la ruggine del Grano nella Sicilia occidentale.** [Ten years' observations on Wheat rust in western Sicily.]—*Riv. Pat. veg.*, xxix, 7–8, pp. 337–357, 1939.

During ten years' observations on outbreaks of wheat leaf rust (*Puccinia triticina*) [*R.A.M.*, xiii, p. 18] in western Sicily uredosori were found present in November, 1933, on a few badly growing plants that had been sown under irrigated conditions in July of that year; in January and February, 1934, the new leaves on the same plants were severely infected. The same phenomenon occurred in 1935–6. Epidemics were observed in February, 1936; in March or April in 1930, 1931, 1933, and 1934; in May in 1932 and 1939; and in June, 1938: apparently for epidemics to occur the plants must have reached a stage of growth in which they are relatively susceptible.

The high temperature of 42° C. reached in July, 1931, may have exerted

a deleterious effect on the germination of the uredospores and the wild hosts of the fungus and have occasioned the considerable delay in the development of the epidemic in 1932. Similarly no epidemic occurred in 1935, which year had again been preceded by a very hot summer in 1934. In 1932, wheat, which was in an excellent condition on 13th May save for a few leaves showing uredosori, developed an intense epidemic by the 30th following a few hot humid days. The incubation period under these conditions lasted eight days. In the case of very late infections on wheat nearer ripening the incubation period was longer, extending to about four weeks (for the formation of uredospores) in June, 1938.

Under Sicilian conditions no aecidia of *P. triticina* have ever been observed, even in two years when species of the alternate host, *Thalictrum*, were grown experimentally beside and among severely affected wheat plants. It would therefore appear that locally *P. triticina* only very exceptionally passes to an alternate host. The teleutospores of *P. triticina* never develop normally under Sicilian conditions, as the infected plants dry up too soon; when they do occur, on the straw, they seldom germinate. Uredospores that develop on wheat in May and June apparently survive the summer on this host and germinate in the autumn [ibid., xviii, p. 167].

The effect of sowing date on susceptibility varies to some extent with the prevailing weather and the locality concerned. In the spring of 1939, Sammartinara wheat sown in November at Palermo was much more severely attacked than when sown in January.

Ten years' results have shown that the most susceptible varieties locally are Majorca, Mentana, and Sammartinara, followed in order of decreasing susceptibility by Ardito, Dauno III, Realforte, Biancolilla, Bidi, Sen, Cappelli, Russello, Aziziah, Regina, Russia, Timilia, Roma, Villa Gloria, and Vincetutti. The last three varieties have been tested for resistance only once.

Bever (W. M.). **Reinoculation of resistant varieties of Wheat with purified physiologic races of Tilletia tritici and T. levis.**—*Phytopathology*, xxix, 10, pp. 863–871, 1939.

A tabulated account is given of the writer's trials from 1935 to 1937 at the Idaho Agricultural Experiment Station to determine the effect on the wheat varieties, Hybrid 128, Oro, Ridit, Martin, Albit, White Odessa, Hussar, and Turkey, all resistant to bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], of repeated reinoculation with six 'purified' physiologic races (collected from the varieties themselves), viz., T–6, T–8, T–9, T–10, L–6, L–8, and a species hybrid [*R.A.M.*, xvii, pp. 505, 665, *et passim*]. With the exception of the last-named, none of the 'purified' races caused any significant increase of infection over the three-year period. The species hybrid induced a rising incidence of infection on Turkey—from 9 per cent. in 1935 to 11 in 1936 and 35 in 1937—indicating that the component of the inoculum to which the variety is resistant was being strained out, leaving a concentration of the more virulent portion. The discrepancy between the author's results and those of Bressman [ibid., xi, p. 33], Melchers [ibid., xiv, p. 227], and Dillon Weston [ibid., viii, p. 436] is attributed to the

use in the present experiments of 'purified' races of the bunt fungi on the lines indicated by Flor [ibid., xiii, p. 86].

WALSTEDT (I.). **Några erfarenheter rörande stinksotets fördelning på fältet.** [Some observations on the field distribution of bunt.]—*Landtmannen, Uppsala*, xxiii, 35, p. 855, 1 fig., 1939.

Observations in 1938 at Linköping, Sweden, on a 3-hect. autumn wheat field revealed striking disparities in the incidence of bunt [*Tilletia caries* and *T. foetens*] in the six strips of rows, 100 by 1 m., traversed at right angles for the purpose of counting, the numbers of diseased plants per 10 sq. m. being 0·4, 0·5, 3, 6, 15, and 45 in strips 1, 2, 3, 4, 5, and 6, respectively. The seed-grain having all been treated before sowing, the uneven distribution of infection in the field is attributed to differences in the constitution of the soil, the clay-mould on a calcareous substratum of the upper part being evidently more favourable to the fungus than the deep clay of the lower portion. In 1939 the incidence of bunt in a crop from treated seed-grain rose from two to five plants per 10 sq. m. with a week's delay in sowing.

SPRAGUE (R.). **Controlling seed-borne stinking smut of Wheat by disinfectants.**—*Bull. Ore. agric. Exp. Sta.* 363, 33 pp., 1939.

In field experiments carried out in Oregon from 1934 to 1938 complete control of bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: *R.A.M.*, xviii, p. 301] in Hybrid 128 wheat was obtained with new improved ceresan, 52 per cent. copper carbonate, 50 per cent. basic copper sulphate, and 26 per cent. copper fungicide, the first-named being used at the rate of $\frac{1}{2}$ to $\frac{3}{4}$ oz. per bush. and the others at that of 3 oz. per bush. for winter and 2 oz. for spring wheat. Bunt development becomes more serious when wheat is sown late in September in increasingly cold and moist soil and control measures were found to decrease in effectiveness with successively later dates of sowing [ibid., xiv, p. 681 *et passim*]. Under late sowing conditions copper carbonates containing 18 to 20 per cent. copper were ineffective, that containing 52 per cent. giving better but still unsatisfactory results, while new improved ceresan at increased rates of $\frac{3}{4}$ to 1 oz. per bush. and basic copper sulphate were fairly effective. The importance of soil-borne bunt is stated to have diminished since the introduction of the combine harvester, for when the threshing was done with the stationary machines late in the season the clouds of bunt spores settled over the summer fallow, whereas with combine harvesting the bunt shower is distributed earlier and is smaller in quantity. Where soil-borne infection occurs in a severe form it is practically beyond control, but light soil infestation is held down though not eliminated by copper dusts at 3 or preferably 4 oz. per bush., or new improved ceresan (1 oz.) applied just before sowing.

The length of time between treating with a copper dust and sowing had no effect either on the germination of the seed-grain or the effectiveness of the fungicide, but seed-grain treated with new improved ceresan at $\frac{1}{2}$ to $\frac{3}{4}$ oz. per bush. showed increased stands over untreated if sown a few days after treatment. After six weeks in storage seed-grain so treated slowly decreased in viability, so that after one year it had to be sown about 10 per cent. more thickly than normal. Grain treated at

the rate of 1 oz. per bush. should be sown within a week to produce improved stands, though the decrease in viability after several weeks is only slight, whereas after 14 months in storage the loss in stand is about 10 to 15 per cent.

There was little difference in facility of control on any of the better soils for growing wheat in the State, all being capable of permitting heavy infection, but on acid soils control was easier, while on heavy ground all treatments that weaken germination should be avoided. The addition of unbroken bunt balls to healthy grain in proportions varying from 3 to 30 per cent. materially reduced the effectiveness of the fungicides. New improved ceresan at $\frac{1}{2}$ oz. per bush. was ineffective, but good control was obtained with the 1 oz. rate (0·5, 7·9, 1·6, and 0·2 per cent. bunted ears occurring in treated seed with 30, 5, 18, and 5 per cent. bunt balls, respectively). Good control was also obtained with formalin (1 in 320, soaking for 5 to 10 minutes), and complete elimination with copper sulphate solution in 2·5 per cent. O.S. Vatsol, a wetter, although the wet treatments were injurious to germination. Control with copper dusts was somewhat uncertain. Under farm conditions, since very little seed-grain contains more than a trace of bunt balls, treatment with new improved ceresan at $\frac{1}{2}$ to $\frac{3}{4}$ oz. is usually sufficient, but moderate or excess quantities of balls would require the $\frac{3}{4}$ to 1 oz. rates. In a footnote it is stated that bunt balls may be killed at the $\frac{1}{2}$ oz. rate if the grain is covered for three days after treating.

In comparative tests of copper dusts, the differences between the effectiveness of various brands of copper carbonate and basic copper sulphates with 50 to 54 per cent. copper were no greater than those observed between different lots of the same brand. Copper dusts containing about 26 per cent. copper were effective against medium and light infections of bunt, but the copper carbonate dusts containing 18 per cent. copper were distinctly less effective under adverse conditions. A number of other copper dusts were not sufficiently effective or too costly. Monohydrated copper sulphate and anhydrous cupric chloride were effective but irritating to the nose, and hygroscopic. Arsenic compounds gave good control but are too dangerous to use.

For the control of bunt in spring wheat, which is more amenable to treatment than that in autumn-sown stands, new improved ceresan at $\frac{1}{2}$ oz. per bush. or copper dusts at 2 oz. are recommended. It appears desirable to treat Ridit and other wheat varieties resistant to seed-borne races of bunt to reduce the losses from the disease and from winter injury attributed to latent bunt infection. The summarized data on seed-grain treatment with the recommended disinfectants showed increased stands in from 44 to 90 per cent. of the cases.

JONES (G. H.). **Systematic and automatic warm water steeping to control loose smut of Wheat.**—*Bull. Minist. Agric. Egypt* 220, 12 pp., 10 pl., 1939.

In experiments on warm water steeping for the control of loose smut of wheat [*Ustilago tritici*: *R.A.M.*, xvi, p. 245] seed-grain, in lots of 5 kg., was steeped in a large incubator for 10, 8, and 6 hours at 40° C.; 8, 6, and 4 at 43°; and 6, 4, and 2 at 46°, and after the treatment thoroughly dried in the sun for the whole day. All these treatments reduced the

percentage of loose smut from 4·11 in the untreated control to between 0·095 and 0, but the percentage of germination in completely controlled plots fell from 99 to between 49 and 57 in the laboratory and was very low in the field. The best results were obtained with soaking for six hours at 43°, the percentage of germination being then 97, that of infection 0·014, and consequently the efficiency of disease control 99·66 per cent.

At the Government farm the produce of miniature chequers of selected new wheats or the best of the established varieties is used for planting the so-called nucleolus (about 60 kg.) on about a quarter of an acre, the produce of which is in turn used next year for planting the nucleus (about 600 kg.) on about 5 acres, and the produce of that (about 6 tons) planted the following year on a large scale separately from other wheats to prevent crossing and mixing. Under this system treatment may be made most conveniently at the nucleolus stage.

An automatic machine for warm water treatment, designed in Egypt, is described. It consists of a large, circular tank insulated against heat, with an outer case fitted with four wheels running on short rails. On the bottom of the tank is placed a ring-shaped, perforated seed basket with a capacity for 75 kg. grain, into which seed is fed from a hopper above the tank. For treatment the tank is filled with about 280 l. of previously heated water (at 41·5° in the typical experiment described) and maintained at a controlled temperature. When treatment is completed (after six hours) the tank is pushed forward on the rails so that the basket with the treated seed can be hoisted out by means of a chain block and, after the tank has been pushed back again, can be lowered and emptied of seed. The apparatus can be set for the seed to fall into the perforated basket at any given time, and at completion a bell is rung automatically, warning the operator to empty the charge.

In 1935 the amount of loose smut on the nucleolus plot of 2/5 feddan of the Beladi 116 wheat (a new variety of *Triticum durum*) was counted as 219 plants, or 550 per acre. Roguing of plant rows begun in the same year, and one treatment of the seed from this plot carried out in 1936 by means of the machine described above reduced the amount of loose smut in the following year's nucleus plots of 10 feddans to 7·2 plants per acre, showing a disease control efficiency of 98·7 per cent. In the same year new seed from rogued rows was treated and sown for the nucleolus crop which was completely free from disease. It is clear from these results that roguing the plant rows combined with a single warm water steeping is sufficient to eliminate the disease entirely, the second generation remaining uninfected.

Zade (A.). **Havrens infektion genom Ustilago avenae (Persoon) Jensen.** [Infection of Oats by *Ustilago avenae* (Persoon) Jensen.]—*Nord. JordbrForskn., 1939*, 3, pp. 290–305, 1939. [German summary.]

Evidence is adduced from the author's previous investigations, and from recent experiments in Sweden, that the infection of oats by loose smut (*Ustilago avenae*) takes place through the resting mycelium, which develops within the glumes, and penetrates the seedlings in the following spring [*R.A.M.*, xii, p. 431]. A test on the Svalöv's, Guldregn, and Orion varieties showed that infection was practically negligible (maxi-

mum 0·3 per cent.) on plants of which the glumes were closed with paraffin, whereas up to 4·4 per cent. smut developed on those with open glumes, indicating that even the presence of virulent inoculum (as in this case) on the exterior of the glumes is of little importance in the etiology of the disease. The objections of McKay [ibid., xv, p. 790] and Kitunen [ibid., xvii, p. 309] to this view of the mode of infection are not accepted.

WELSH (J. N.). **Vanguard Oats—origin, description and performance.**—*Publ. Canad. Dep. Agric.* 651 (*Fmrs' Bull.* 76), 14 pp., 4 figs., 1939.

In co-operative tests carried out at various centres in western Canada from 1935 to 1938, the average percentages of stem rust [*Puccinia graminis*], crown rust [*P. coronata*], and loose and covered smuts [*Ustilago avenae* and *U. kolleri*] in strain 339 of Vanguard oats (a cross between Hajira and Banner made in 1926) were 0, 45, and 1·5, respectively, the corresponding figures for Vanguard 7 (a more prolific selection from the foregoing), Rusota, Anthony, Banner, and Gopher being 0, 45, and 1·6; 0, 45, and 2·3; 0, 45, and 10·9; 20, 70, and 3·5; and 10, 75, and 0·9, respectively. The eastern Canadian trials (1936 to 1938) yielded data indicating that Vanguard may be specially recommended for areas (such as eastern Ontario) where stem rust is prevalent, whereas Erban, a new variety produced at the Ontario Agricultural College, is preferable for districts liable to severe epidemics of crown rust.

MALAN (C. E.). **La Calonectria graminicola (Berk. et Brme) Wr sulle carriosidi di Segale della zona alpina (Alpi Cozie).** [*Calonectria graminicola* (Berk. & Br.) Wr on the inflorescences of Rye from the Alpine zone (Cozie Alps).]—*Nuovo G. bot. ital.*, N.S., xlvi, 2, pp. 323–325, 1939.

In 1938 the author observed that on an average over 30 per cent. of the culms in rye fields in the Cozie Alps bore the perithecia of *Calonectria graminicola* [*R.A.M.*, xviii, p. 516], which were also present on the lower leaf sheaths. Infection of the inflorescences, however, was found to be very slight, over 95 per cent. germination of the grain being secured; the conidial stage (*Fusarium nivale*) developed in some inflorescences in only 6 out of 14 lots, and appeared on only 4·4 per cent. of a sample taken from all lots and incubated on acidified carrot agar. In a further test, 135 inflorescences treated with uspulun 1 in 1,000 for 30 seconds showed only one infected by *F. nivale*, confirming the author's view that infection was merely superficial contamination.

HOPKINS (J. C. F.). **Mycological notes. 12. The Diplodia danger.**—*Rhod. agric. J.*, xxxvi, 10, pp. 721–723, 1939.

Attention is drawn to the fact that at least 10 per cent. of the maize crop, that is, about 200,000 bags of maize, are annually lost in Rhodesia owing to attacks by the *Diplodia* disease [*D. zeae* and *Gibberella saubinetii*: *R.A.M.*, xv, p. 145], and an appeal is made to growers to protect their crops by practising seed disinfection and disposing of infected trash either by (*a*) ploughing it in deeply early in the year, (*b*) composting all the debris, or (*c*) feeding it to cattle.

LANDEN (E. W.). **The spectral sensitivity of spores and sporidia of Ustilago zeae to monochromatic ultraviolet light.**—*J. cell. comp. Physiol.*, xiv, 2, pp. 217–226, 4 graphs, 1939.

Ultraviolet radiation from a large crystal quartz monochromator retarded the germination and subsequent growth of maize smut (*Ustilago zeae*) spores and sporidia in experiments at Missouri University, Columbia. For 50 per cent. lethality a broad minimum value in incident energy is registered in the neighbourhood of 2,650 Å for both spores and sporidia. The maximum values were recorded at 2,400 Å, below which the incident energy to kill 50 per cent. of the spores decreased slightly, while that required to destroy comparable numbers of sporidia declined more rapidly, the ratios of the incident energies of wave-lengths 2,399 and 2,300 Å for 50 per cent. killing being 1·15 and 3·28 for spores and sporidia, respectively. A comparison of incident energies for a given lethality at wave-length 2,650 Å indicates that the sensitivity of various organisms to irradiation decreases in the following order: bacteria, yeast, sporidia of *U. zeae*, *Rhizopus* spores, *U. zeae* spores. The effective long wave-length limits for the killing of maize smut spores and sporidia falls between 3,022 and 3,130 Å, a dose of $1{\cdot}5 \times 10^6$ ergs per sq. mm. producing no lethal effect at the latter length. At any given wave-length the sporidia are more sensitive to incident radiation than the spores. Using 50 per cent. killing as a criterion, the ratio of the energies required for killing spores and sporidia varies irregularly within the limits of 3·8 at 3,022 and 34 at 2,300 Å.

Measurements of the absorption of sporidial films indicated that at wave-lengths showing low absorption a high incident dose of energy must be applied and vice versa.

CASTELLANI (E.) & CICCARONE (A.). **Malattie crittogamiche del 'Teff'.** [Fungal diseases of 'Tef'.]—32 pp., 11 figs., 4 graphs, Florence, Regio Istituto agronomico per l'Africa italiana, 1939.

In this paper, extracted from a book edited by Ciferri and Baldrati under the title 'Il Teff (*Eragrostis tef*)', E. Castellani and A. Ciccarone describe the diseases of this cereal crop observed by them in Italian East Africa during 1937 to 1939.

In new Eritrea and Amara (especially the basin of the Tana) the most prevalent disease is rust (*Uromyces eragrostidis*), which generally attacks the plants when the tassel has emerged. The uredosori form sparse, oblong pustules 0·6 to 0·8 mm. long on the upper surface of the leaves, culms, leaf sheaths, and rachids. The globose or ellipsoidal, echinulate uredospores measure 20 to 24 by 18 to 21 μ, with an epispore 1 to 1·8 (generally 1·4) μ in diameter. The unicellular, smooth, light brown, ovate, clavulate, or almost piriform teleutospores have an epispore thickened at the apex, measure 25 to 30 by 18 to 23 μ, and are borne on a light stalk about 30 by 4·5 to 4·6 μ. No aecidia or pycnidia were observed. Infection appeared to reduce the weight of the yield of grain by 10 to 25 per cent.

Bunt (*Tilletia baldratii* Montem.) frequently attacks whole inflorescences, which become conspicuously erect, with sparse ears, and swollen, open, and prematurely dry glumes. The dark snuff-coloured, globose,

piriform, or irregularly elongated chlamydospores measure 15 to 26 μ in diameter, and are provided with an epispore surrounded by a characteristic persistent, hyaline, gelatinous covering.

In western Ethiopia *Helminthosporium miyakei* [*R.A.M.*, viii, p. 530] is commonly present as a blackish growth on the ears. The acropleurogenous, 3- to 4-septate, olivaceous, sometimes translucent, oval, later variously shaped conidia measure 28 to 90 by 9 to 19 μ.

A withering of the apical part of the lower leaves was caused by a fungus with olivaceous-brown, subspherical or ellipsoidal, ostiolate pycnidia measuring 100 to 115 by 90 to 100 μ. The straight or slightly curved, rod-shaped, hyaline conidia, pointed at one end and rounded at the other, measured 20 to 30 by 2 to 2·7 μ, and showed two or three septa at maturity. This fungus is named *Septoria eragrostidis* n.sp. In some material, perithecia were observed measuring 95 to 120 by 90 to 110 μ, with clavate, rounded, almost ellipsoidal asci measuring 36 to 44 by 18 to 24 μ, and hyaline, fusoidal spores 12 to 15 by 4·5 to 5·2 μ. This fungus, which is probably genetically related to *S. eragrostidis*, is named *Mycosphaerella eragrostidis* n.sp.

A fungus apparently agreeing with *Phoma depressitheca* Bubák was observed on withering leaves of one plant and *Aposphaeria eragrostidis* n.sp. on the ears, associated with a black spotting. In damp conditions, the culms, leaves, and inflorescences show a black discoloration due to *Alternaria* and *Cladosporium* spp. and a species of *Coniosporium*. Latin diagnoses are given of the new species.

FAWCETT (H. S.) & KLOTZ (L. J.). **Infectious variegation of Citrus.**—*Phytopathology*, xxix, 10, pp. 911–912, 1 fig., 1939.

In October, 1937, lemon leaves of a tree at Glendora, California, were observed to show an irregular chlorotic variegation, which was transmitted in the course of a few months by budding to a sour orange stock. The foliage of the latter developed irregular chlorotic areas, 5 to 10 mm. or more in width, while small, rapidly growing leaves also exhibited the characteristic pale flecking near the veinlets associated with psorosis [*R.A.M.*, xviii, p. 735]. Some of the mature leaves developed warping and pocketing, suggestive of crinkly leaf of lemon [ibid., xiv, p. 505]. In a general way the symptoms of the disorder on orange resemble those described by Petri as infectious chlorosis [ibid., xi, p. 173]. Lemon buds from another tree at Chula Vista, California, showing less conspicuous foliar symptoms and bark psorosis on sweet orange stock, transmitted to a sour orange stock by budding a mild form of the infectious chlorosis herein described, suggesting a possible relationship between psorosis and infectious chlorosis.

FAWCETT (H. S.) & RHOADS (A. S.). **Lesions on Quercus laurifolia similar to those of leprosis on Citrus in Florida.**—*Phytopathology*, xxix, 10, pp. 907–908, 1 fig., 1939.

In 1932 lesions strikingly similar to those of leprosis on citrus [*R.A.M.*, xvii, pp. 27, 595, 812] were observed on small branches and twigs of young laurel oak (*Quercus laurifolia*) trees in close proximity to affected oranges on the east and west coasts of Florida and elsewhere in the State. Whether the injuries on the two hosts are due to an identical

agent, presumably of virus origin, remains to be determined. The almost invariable occurrence of the disorder near bodies of water in Florida and its frequent location in such sites in South America suggest that the vector is one that flourishes in humid situations.

DOIDGE (E[THEL] M.) & TURNER (F. A. S.). **Psorosis or scaly bark of Citrus trees.**—*Fmg S. Afr.*, xiv, 161, pp. 363–364, 1 fig., 1939.

Evidence is presented of the transmission of citrus psorosis by budding, the sole method of any commercial importance in South Africa [*R.A.M.*, xviii, p. 438], where infection may remain latent in individual trees for 20 to 30 years or more; in any case, the symptoms do not commonly appear until the trees are 9 to 10 years old. A grower at Pomona, in the Rustenburg district took buds for a nursery from three externally sound Valencia oranges on his own farm which later developed psorosis; some nine years later nursery-grown trees transplanted to the orchard began to show signs of the disease and spread continued after a lapse of 22 years. Inspectors have observed that certain nurseries consistently produce trees affected by psorosis, whereas others remain free from the disorder. In one orchard, three trees procured from a particular nursery were diseased in 1929 and 81 in 1937; on another property belonging to the same grower, 21 out of 1,000 trees from his own nurseries have shown bark lesions. On the other hand, in two orchards containing, respectively, 1,200 and 5,300 12- to 15-year-old trees supplied by a different nursery, no infection has been found.

It is pointed out that, although the elimination of sources of infection is provided for by the Psorosis Act (No. 42) of 1927 [ibid., vii, p. 128], a number of years must elapse before the full benefits of this measure are experienced, since the majority of South African citrus plantings were established after 1920. The common practice among nurserymen of taking buds from young trees, in which, as indicated above, psorosis may be latent, is greatly to be deprecated.

WARDLAW (C. W.) & LEONARD (E. R.). **Storage investigations with Trinidad Grapefruit, 1938–39.**—*Trop. Agriculture, Trin.*, xvi, 9, pp. 208–215, 5 graphs, 1939.

Further investigations into the storage of grapefruit in Trinidad [*R.A.M.*, xvi, p. 600] are reported on fruit harvested during the wet season. 'Gooseflesh' blemishing (oleocellosis) [ibid., xviii, p. 805] was found on the whole to be a minor problem in Trinidad, affecting up to 12 per cent. of the fruit in some cases. The blemishes appear within 24 hours of picking and no marked increase in the extent of original blemishes takes place later. The liability to oleocellosis varied from one estate to another, being chiefly related to time of picking (more blemishing developing in fruit picked at 7 a.m. than in that picked at 10 a.m.) and, to a lesser extent, to the length of the quailing period. On estates subject to oleocellosis picking in the rain should be avoided, and in general it should not be undertaken during the wet season before 10 a.m. Each estate should carry out a test to determine the optimum conditions for picking.

Considerable differences were found to exist in the amount of fungal wastage in fruit from different estates, and very satisfactory control was

again obtained with rapid cooling to 45° F. after minimum exposure to tropical temperatures. In untreated fruit held at tropical temperatures practically all fungal wastage was caused by *Botryodiplodia theobromae* [ibid., xviii, p. 193], whereas in fruit which had been dipped in borax and treated with ethylene, the chief cause of wastage was *Colletotrichum gloeosporioides* [loc. cit.]. It was shown that while the ethylene-treated fruit showed some decrease in wastage (*B. theobromae*) due to debuttoning, the borax treatment considerably increased the trouble by causing premature development of latent infections of *C. gloeosporioides*. The two moulds (*Penicillium digitatum* and *P. italicum*) for the control of which borax is especially intended are stated to be of minor importance in Trinidad, and the discontinuance of the treatment is therefore recommended.

For fruit picked during the wet season it was found that the chilling temperature lies close to 45°, the temperature at present used for storage. If, in order to achieve a more rapid cooling, air is delivered into storage rooms at 40°, this ought not to be continued beyond 12 to 15 hours and the temperature then raised to 45°.

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FARKAS (A.). **Control of wastage of Citrus fruit by impregnated wrappers on a commercial scale.**—*Hadar*, xii, 8–10, pp. 227–230, 1939.

Further particulars are given of the author's successful experiments in 1938–9 on the control of storage rots of Palestine oranges [chiefly *Penicillium digitatum*, *P. italicum*, and *Diplodia natalensis*: *R.A.M.*, xviii, p. 102] by the use of diphenyl-impregnated wrappers. In two consignments of second-grade oranges dispatched to England in December, 1938 (20 boxes) and February, 1939 (38), the average amounts of wastage in the lots wrapped in impregnated paper were 1·5 and 0·37 per cent., respectively, compared with 9 and 9·57 per cent. in those wrapped in ordinary paper.

The largest consignment, shipped in April, 1939, containing 3,770 oranges in impregnated wrappers from 37 groves, also arrived in a satisfactory condition, with roughly 3 per cent. wastage as compared with 10 per cent. or more in most other lots received at the same time. In a storage experiment with oranges packed in January and February (180 in each month), the amounts of wastage after 4½ months in the former lot were less than 2 per cent. and semi-total in impregnated and ordinary wrappers, respectively, and in the latter after 3½ months again under 2 per cent. in the diphenyl-treated, while the ordinary wrapped fruit was completely rotted after three months. In a test made with lemons at a time when these fruits are apt to 'rot in the hand', the average percentages of wastage after 17 days in two lots of 1,200 each, one treated and the other wrapped in the ordinary way, were 11·2 and 46·3 per cent., respectively.

No ill effects followed the oral administration to a rat 160 gm. in weight and a monkey (2·5 kg.) of diphenyl over periods of 20 and 17 weeks, respectively, the weekly amounts consumed being 16 and 90 mg., respectively, corresponding to weekly doses of 7 and 2·5 gm. for a man

weighing 70 kg. A research student who consumed 435 mg. of the chemical in 13 weeks was also unaffected.

The cost of production of the impregnated wrappers on the largest of the three machines tested is calculated at $\frac{3}{4}$*d.* per box, corresponding to 2*s.* per ton of fruit. It is thought that by the use of treated wrappers a further minimum saving of £25,000 per annum will be effected over the £100,000 estimated in 1937–8, when the cost of producing the wrappers was reckoned at over double the figure now found to be practicable.

SHIFF (M.). **The influence of orchard conditions on the incidence of wastage in Palestinian Oranges.**—*Hadar*, xii, 8–10, pp. 233–236, 1939.

The results of a series of experiments carried out over a four-year period at the Jaffa Horticultural Station demonstrated the importance of the time of picking in relation to wastage in stored oranges due to *Penicillium digitatum*, *P. italicum*, *Diplodia* [*natalensis*: see preceding abstract], and 'nooksan' [*R.A.M.*, xviii, p. 102]. In the case of the fungal rots, oranges picked in March are more extensively damaged than those gathered in January, whereas the incidence of 'nooksan' tends to decline in the later pickings. To cite some figures, the two-year percentual averages of (*a*) *P. digitatum* and *P. italicum* and (*b*) *D. natalensis* in young trees (8 years old) were 0 and 0, respectively, and in old trees (25) 0·9 and 0, respectively, for the January pickings, the corresponding March figures being 1·7 and 0·3 and 0 and 0·7, respectively; the average 'nooksan' incidence in young and old January pickings was 9·7 and 5·6 per cent., respectively, the March figures being 3·5 and 4·1, respectively.

Oranges from trees budded on sour orange stock are less liable to waste from the three sources under discussion than are those on sweet lime. Thus, the average four-year incidence of the two moulds, *D. natalensis*, and 'nooksan' in the January sour orange stock pickings, were 1·1, 0, and 3·8 per cent., respectively, the corresponding figures for March being 2·5, 3·9, and 2·4, respectively. For sweet lime the January averages were 3·4, 1, and 5·3, and those of March 3, 9·9, and 4·1, respectively.

In tests to determine the influence of the soil type on the various rots on Shamuti oranges budded on sweet lime, the average infection percentages of the two moulds, *D. natalensis*, and 'nooksan' in January-picked fruit on 'kurkar' soils were, respectively, 2·7, 4·1, and 7·8; on light soils 2, 1·3, and 4·5; and on heavy soils 0·3, 0·9, and 2·5; the corresponding March figures being 13·3, 11·7, and 16; 5·4, 3·7, and 6; and 2·2, 3·8, and 5·2, respectively. It is apparent from these data that wastage from all causes is heavier in fruit picked in March than in that picked in January, and that oranges grown on 'kurkar' soil are more liable to deterioration than those on the other types, of which the heavy was the more beneficial, also as regards firmness in keeping. Fruit from trees grown on 'kurkar' should be picked early to avoid serious losses.

Medium irrigation proved to be more favourable than either the maximum or minimum in two years' tests on Shamuti oranges on sweet lime stocks, the average percentages of the two *P.* spp., *D. natalensis*,

and 'nooksan' being 0, 1, and 1·4, respectively, for the medium plot, 1·1, 3·4, and 3·4 for the maximum, and 0·8, 1·2, and 3·9 for the minimum. The rots were more severe on the maximum and 'nooksan' on the minimum plot.

The best of six different fertilizing combinations tested for three years was one consisting of 2 kg. nitrochalk, 1 kg. superphosphate, $\frac{2}{3}$ kg. potash, and 4 kg. lime per tree, the average incidence of the two moulds, *D. natalensis*, and 'nooksan' in oranges picked at the beginning of February and end of March being 0·1, 0·1, and 5·4, and 5, 4·6, and 5 per cent., respectively, compared with maxima of 7, 10·9, and 13·5 per cent., respectively, in fruits from trees receiving other treatments.

Although definite conclusions as regards the effects of the following pre-storage factors on orange wastage would be premature at the present stage, experiments on the hours of picking tended to show a heavier incidence of *D. natalensis* in fruit gathered late (three-year average of 12 and 2·1 per cent. in the January and March pickings, respectively, as against 7·5 and 1·4, respectively, for early-gathered), while with 'nooksan' the reverse was the case, the early morning percentages in January and March being 10·2 and 6·1, respectively, compared with 7·1 and 2·6, respectively, for the later gatherings. The mould incidence did not differ appreciably in the two lots. Picking soon after rain increased the amount of mould in two years' trials (2·4 per cent. as against 1·3 in fruit left for two days), whereas *D. natalensis* and 'nooksan', especially the latter, were more abundant in dry fruit (2·9 and 46·8 as against 0·6 and 36·3 per cent., respectively, in fruit picked when wet). Wilting did not materially influence the amount of mould in oranges in three years' tests, but increased the incidence of *D. natalensis* in the March pickings (up to a maximum of 40·1 per cent. after four days in 1933), while that of 'nooksan' was diminished from 7·8 to 3·8 and from 5·9 to 2·3 per cent., in the January and March pickings, respectively, after seven days.

BAIN (D. C.). **Effect of sulphuric-acid treatment on fungi and bacteria present on Cotton seed from diseased bolls.**—*Phytopathology*, xxix, 10, pp. 879–884, 1 fig., 1939.

Fewer fungi, including *Sordaria* (most commonly), *Diplodia natalensis*, *Fusarium moniliforme* [*Gibberella fujikuroi*: *R.A.M.*, xviii, p. 787], and *F. oxysporum*, and bacteria were isolated on potato dextrose agar from some 8,000 delinted cotton seeds from bolls infected by *Bacterium malvacearum* [loc. cit.] after 45 and 60 minutes' immersion in concentrated sulphuric acid than following shorter periods (15 and 30 minutes) of treatment, the average percentages from floating and sinking seeds [ibid., xviii, p. 105] for the 15-, 30-, 45-, and 60-minute dips being 37 and 11·9, 37·6 and 27, 29 and 12·2, and 14·2 and 16·1, respectively. The average germination of sinking seeds, as well as their health, were superior to that of floating material (90 as compared with 73·8 per cent.). An additional treatment of half the seeds in a 1 in 1,000 mercuric chloride solution in 50 per cent. alcohol did not appreciably affect either their fungal content or germinability. In a special test of 400 seeds treated in sulphuric acid for an hour and dissected aseptically, three colonies of *Bact. malvacearum* were recovered from the seed coat

and two from the embryo. All these cultures produced definite angular leaf spot lesions on young cotton plants sprayed with suspensions of them.

VASUDEVA (R. S.) & ASHRAF (M.). **Studies on the root rot disease of Cotton in the Punjab, VII. Further investigation of factors influencing incidence of the disease.**—*Indian J. agric. Sci.*, ix, 4, pp. 595–608, 2 graphs, 1939.

The results of experiments on the effect of soil temperatures of 25°, 30°, 35°, and 39° C. on cotton root rot (*Macrophomina phaseoli* and *Rhizoctonia* [*Corticium*] *solani*) [*R.A.M.*, xviii, p. 674] in the Punjab showed that mortality due to these two fungi was highest in soil maintained at 39° and 35°, respectively. *M. phaseoli* was actively parasitic at all the temperatures tested, while the parasitism of *C. solani* declined at temperatures above and below 35°. In another series of experiments, inoculated plants were placed in water tanks at soil temperatures of 20° and 35° for 24 hours and then transferred from 20° to 35° and from 35° to 20°, respectively. Inoculated and uninoculated controls were maintained at 20° and 35°. The results showed that the incidence of *C. solani* was definitely reduced by lowering the temperature from 35° to 20°, whereas such a fall did not materially affect the incidence of *M. phaseoli*. When the soil temperature was raised from 20° to 35° mortality due to both fungi was nearly as high as in controls kept at 35° throughout. High humidity and low temperature (in covered plots) appeared to be unfavourable to the spread of infection. Preliminary tests indicated that infection was significantly reduced by sowing a mixed crop of sorghum and cotton.

No difference was found in the texture and chemical composition of healthy and diseased soils, except that the latter contained a larger amount of acid soluble calcium than did the former, and had a higher calcium to magnesium ratio. There was no correlation between the P_H value of the soil and disease incidence.

HART (F.). **Fungal infestation of powdered drugs.**—*J. Amer. pharm. Ass.*, xxviii, 6, pp. 374–376, 1939.

Eight drug powders susceptible to mould infection, viz., althaea, capsicum, cascara, ginger, liquorice, rhubarb, mustard, and sarsaparilla, were inoculated at the College of Pharmacy, New York City, with *Aspergillus niger*, *Penicillium glaucum*, and *Rhizopus nigricans* [cf. *R.A.M.*, xiv, p. 114]. The first- and last-named organisms grew most rapidly and profusely on althaea, while mustard was the preferred substratum of *P. glaucum*. Details are given of the appearance of the moulds on the various drugs, which are regarded as constituting a very valuable criterion for the differentiation of fungal cultural characters.

CHRISTENSEN (B. V.) & REESE (J. A.). **Changes in ergot with various moisture contents under different conditions of storage.**—*J. Amer. pharm. Ass.*, xxviii, 6, pp. 343–360, 1939.

In connexion with a study at the School of Pharmacy, University of Florida, on the factors governing deterioration in stored [rye] ergot [*Claviceps purpurea*: *R.A.M.*, xviii, p. 314] of Spanish and Portuguese

origin, it is mentioned that mould [unspecified] developed in all the samples with a moisture content exceeding 9 per cent., but was absent from those with under 6 per cent.

VIÉGAS (A. P.). **Un amigo do fazendeiro Verticillium lecanii (Zimm.) n.comb., o causador do halo branco do Coccus viridis Green.** [A friend of the farmer, *Verticillium lecanii* (Zimm.) n.comb., the agent of white halo of *Coccus viridis* Green.]—*Rev. Inst. Café S. Paulo*, xiv, 150, pp. 754–772, 18 figs., 1939.

Following a summary and discussion of the previous literature on the host range, nomenclature, economic importance, and geographical distribution of the entomogenous fungus *Cephalosporium lecanii* [*R.A.M.*, xviii, p. 380], the writer describes the occurrence of the organism on the destructive coffee pest, *Coccus viridis*, in São Paulo, Brazil, and presents the results of his studies on its life-history, taxonomy, mode of transmission, practical application, and other points of interest.

In the Campinas district the fungus is inoculated by means of an ant, *Camponotus cameranoi*, into the cochineal larvae, which lose their natural green tint, shrivel, and are transformed into quasi-transparent pellicles, covered with a white fungal growth under humid conditions. Adult females are also deprived by the fungus of their gloss and colour, turning yellow and becoming encircled by a dense, white halo, averaging 1 mm. in diameter, composed of fasciculate conidiophores which give rise to apical hyaline conidia, abstricted distally into heads. Frequently a bundle of conidiophores, originating within the insect, proceeds by way of the anal aperture to the exterior, covering the middle and posterior of the body with a white tuft. Dead cochineal insects completely enveloped by the fungus break up into minute scales edged with a dirty white down. The hyphae never perforate the thick outer integument of the insects but rupture the underlying tissues to gain the exterior. When the insects are entirely consumed the intact integument remains attached to the leaf by means of the hyphae, the white fungal growth gradually acquiring a creamy or yellow tinge. All the internal parts, including the eggs and yeast cells, are destroyed.

The cochineal pathogen was named by Petch *C.* (*Acrostalagmus*) *lecanii* [ibid., v, p. 97], but in view of the invalidity of *A.* [ibid., xvi, p. 237] and the fact that the branching of the conidiophores is characteristic of *Verticillium*, the fungus is renamed *V. lecanii* (Zimm.) n.comb.

As regards the control of the insect by means of the fungus, the writer considers that the prospects of success are very encouraging. Two methods of application may be employed: one consists in affixing to the central, heavily shaded branches of infested plants leaves bearing diseased insects, and the other in spraying the attacked bushes with fungal suspensions in damp, warm weather.

VIÉGAS (A. P.). **Notas sôbre Septobasidium saccardinum (Rangel) Marchionatto.** [Notes on *Septobasidium saccardinum* (Rangel) Marchionatto.]—*Bol. téc. Inst. agron., Campinas*, 60, 14 pp., 4 pl., 1939.

The writer summarizes the knowledge previously available concerning the occurrence of *Septobasidium saccardinum* in Brazil [*R.A.M.*, xviii, p. 521] and presents his own observations on the fungus in associa-

tion with *Aspidiotus symbioticus* on mulberry samples received from the Itatiba district in 1938. The dimensions of *S. saccardinum* are stated to be as follows: probasidia 12 μ, basidia 50 by 8 μ, sterigmata 15 to 18 by 4 μ, and basidiospores 14 to 16 by 4 μ. Attempts to grow the fungus in pure culture have hitherto, contrary to Rangel's experience, given negative results.

CATANEI (A.). **Étude des teignes des animaux en Algérie.** [A study of animal ringworms in Algeria.]—*Arch. Inst. Pasteur Algér.*, xvii, 3, pp. 520–529, 1 pl., 1939.

Equine mycoses in Algeria have been found to be due in the first place to *Microsporon equinum* [*R.A.M.*, xvi, p. 383], *Ctenomyces* [*Trichophyton*] *mentagrophytes* [ibid., xviii, p. 737] and *M. canis* [ibid., xviii, p. 393] being of secondary importance; *M.* [*Achorion*] *gypseum* [ibid., xvii, pp. 36, 395] was observed once on an ass. *T. discoides* [ibid., xvii, p. 395] is responsible for ringworm in calves and occasionally in sheep, from which *T. pruinosum* [ibid., xiii, p. 577] has also been isolated. Dogs are liable to infection by *M. canis*, *T. mentagrophytes*, and *Achorion schoenleini*.

DELAMATER (E. D.). **The Squirrel as a new host to a ringworm fungus.**—*Mycologia*, xxxi, 5, pp. 519–526, 4 figs., 1939.

The ringworm fungus *Trichophyton mentagrophytes* [see preceding abstract] was isolated in pure culture from typical tinea lesions on common grey squirrels living on and near the campus of the Johns Hopkins University. In culture on various media the fungus formed branching clusters of aerial hyphae, micro- and macroconidia, various types of aleuriospore fruiting, racquet mycelium, chlamydospores, spirals, nodular organs, and subsurface hyphae, and these structures are figured. The disease was successfully transmitted to squirrels, cats, and rabbits and in two cases accidental infection of human subjects occurred.

TERASI (T.). **Studien über die Otomycosis, insbesondere 'Otomycosis aspergillina'.** [Studies on otomycosis, especially 'otomycosis aspergillina'.]—*Fukuoka Acta med.*, xxxii, 9, pp. 1449–1537, 3 pl., 1939. [Japanese, with German summary on pp. 87–88.]

Thirty cases of otomycosis aspergillina were observed by the author in 1936 among the 3,952 patients visiting the oto-rhino-laryngological hospital at Fukuoka, Japan, distributed as follows within the genus *Aspergillus* [*R.A.M.*, xviii, p. 313]: *A. hortai* [ibid., xvii, p. 599] 11, *A. sydowi* [ibid., xvii, p. 243] 3, *A. flavus* 9, *A. versicolor* 1, *A. ochraceus* 1, *A. fumigatus* 2, *A. nidulans* [ibid., xvi, p. 317] 2, and *A. niger* 1. Details of the physiological characters of these species are given.

LACAZ (C. DA S.). **Cultura do escarro para pesquiza de cogumelos. Fungos productores de mycoses broncho-pulmonares.** [Culture of the sputum for the identification of fungi. Fungi responsible for broncho-pulmonary mycoses.]—*Brasil-med.*, liii, 13, pp. 393–399; 14, pp. 421–428, 8 figs., 1 diag., 1939. [English summary.]

This is a summary of the available knowledge of the fungi associated with broncho-pulmonary disturbances, with special reference to Brazil, where representatives of the families Eremascaceae Imperfectae and

Aspergillaceae are the chief occupants of the sputum of pseudotuberculous patients.

Cox (A. J.) & Smith (C. E.). **Arrested pulmonary coccidioidal granuloma.**—*Amer. Rev. Tuberc.*, xxvii, 4, pp. 717–734, 8 figs., 1939.

Four cases of completely arrested coccidioidal granuloma (*Coccidioides immitis*) [*R.A.M.*, xviii, p. 800] of the lungs or bronchial lymph nodes are reported, all in men over fifty, in none of whom were the lesions a factor in the cause of death. Similar arrested lesions could be induced at will in white rats or guinea-pigs by intravenous injections of relatively small numbers (up to 1,000 or in some cases 5,000) of spherules of a virulent strain of the fungus, the minimum fatal dose being 10,000. In nearly all the arrested experimental lesions the causal organism remained viable for periods up to 2½ years, while in one of the human cases it was cultured on Sabouraud's dextrose agar 15 years after its first detection. It is concluded that instances of arrested coccidioidal granuloma are more frequent than has hitherto been recognized, probably outnumbering the fatal cases of the disease, and that they are not restricted to the San Joaquin Valley of California.

Sartory (A.), Sartory (R.), & Meyer (J.). **Deux cas d'onychomycose humaine dus, l'un au Trichophyton acuminatum, var. pilosum, l'autre à l'Hemispora stellata Vuillemin.** [Two cases of human onychomycosis, one due to *Trichophyton acuminatum* var. *pilosum* and the other to *Hemispora stellata* Vuillemin.]—*Ann. Inst. Pasteur*, lxiii, 3, pp. 257–268, 6 figs., 1939.

Clinical, cultural, morphological, and serological particulars are given of two cases of onychomycosis at Strasbourg, Alsace-Lorraine, one due to *Hemispora stellata* [*R.A.M.*, xvii, p. 38] in a 36-year-old man and the other caused by *Trichophyton acuminatum* var. *pilosum* in a 42-year-old woman. Both fungi gave positive results in inoculation experiments on guinea-pigs.

Castellani (A.). **Viability of some pathogenic fungi in distilled water.**—*J. trop. Med.* (*Hyg.*), xlii, 15, pp. 225–226, 2 figs., 1939.

On 10th July, 1939, transfers to glucose agar were made from tubes of distilled water inoculated on 5th July, 1938, with *Monilia* [*Candida*] *krusei*, *M.* [*C.*] *pinoyi*, *M.* [*C.*] *tropicalis*, *M.* [*C.*] *pseudotropicalis* [*R.A.M.*, xviii, p. 525], *M.* [*C.*] *macedoniensis* var. *macedoniensoides* [loc. cit.], *Geotrichum rotundatum*, *G. matalense* [ibid., xii, p. 117], *G. asteroides*, *G. rugosum*, *Epidermophyton floccosum* [ibid., xviii, p. 677], *Cladosporium* [*Sporotrichum*] *mansoni* [ibid., xii, p. 246], *Aleurisma* (*Acladium*) *castellanii* [*S.*? *schenckii*: ibid., xvi, p. 608], and *Actinomyces sylvodoriferus*. Typical growth was made within the normal period by all the fungi. The strain of *E. floccosum* used retained its pleomorphic characters unaltered.

Leccisotti (R.). **Miceti come agglutinogeni (saggi di agglutinazione con due Criptococchi patogeni per l'uomo).** [Fungi as agglutinogens (agglutination experiments with two *Cryptococci* pathogenic to man).]—*Pathologica*, xxxi, 572, pp. 243–244, 1939.

From rabbits immunized with two species of *Cryptococcus*, *C. uvae*

[*R.A.M.*, xvi, p. 385] and *C.* [*Candida*] *pinoysimilis* [ibid., xviii, p. 313], isolated from human mycoses of the tongue and tonsils, respectively, the writer obtained sera agglutinating at the high dilutions of 1 : 3,200 to 1 : 6,400.

BENHAM (RHODA W.). **The cultural characteristics of Pityrosporum ovale—a lipophylic fungus.**—*J. invest. Derm.*, ii, 4, pp. 187–203, 2 pl., 3 figs., 1939.

Full details are given of the writer's successful experiments at the College of Physicians and Surgeons, Columbia University, New York, in the culture of *Pityrosporon ovale* from dermatitis of the human scalp [*R.A.M.*, xviii, p. 394]. In addition to the wort agar used by Moore [ibid., xiv, p. 696], Petroff's egg medium plus gentian violet and Sabouraud's honey agar with fatty substances proved to be suitable substrata. Of the fats tested for incorporation in wort agar, butter and oleic acid gave the strongest stimulus to growth, followed by lanoline, pork and chicken fats, and linseed oil. The fungus was present, in the typical form of bottle-shaped bodies, 2 to 3 by 0·8 to 1·5 (average 2 by 0·8) μ, in the methylene blue preparations from 28 out of 30 cases examined, and 5 of the 8 apparently identical strains were subcultured (one through 25 generations in a little over a year). Inoculation experiments on rabbits gave negative results.

Besides *P. ovale*, 24 strains of *Cryptococcus* [*Torulopsis*: ibid., xvii, p. 676] were isolated from the scalps examined in the course of these studies, 11 falling into group (1), 2 into (2), 4 into (3), and 7 into (4) [ibid., xv, p. 153]. One of the strains assigned to group (1) appears to be a new species with flat, cream-coloured, finely corrugated colonies producing acid and gas from dextrose, and forming oval budding cells, 2·5 to 4·5 μ in diameter, and spindle-shaped cells, frequently joined end to end and constituting a pseudomycelium.

GOUGEROT (H.), DEGOS (R.), & DUCHÉ [J.]. **Pityriasis versicolor achromiant, riche en parasites, non fluorescent à la lumière de Wood.** [Achromatic pityriasis versicolor, rich in parasites, non-fluorescent in Wood's rays.]—*Arch. derm.-syph., Paris*, xi, 4, pp. 365–366, 1939.

The writers examined in Paris a case of pityriasis versicolor simulating leprosy in a 34-year-old woman resident for 20 years in Madagascar. *Malassezia furfur* [*R.A.M.*, xviii, p. 311] was present in abundance in scrapings from the numerous white patches on the arms, which were thrown into sharp relief under the action of Wood's rays [ibid., xvii, p. 530], appearing non-fluorescent and of a very pale yellow tint.

BÉKÉSY (N. v.). **Untersuchungen über den Alkaloidgehalt des Mutterkornes. I. Mitteilung: Über die quantitative Bestimmung der Mutterkornalkaloide in einzelnen Sclerotien.** [Studies on the alkaloid content of ergot. Note I: On the quantitative determination of the ergot alkaloids in individual sclerotia.]—*Biochem. Z.*, cccii, 3–4, pp. 187–197, 3 figs., 3 diags., 1 graph, 1939.

In connexion with the writer's recent experiments in the intensive production of rye ergot [*Claviceps purpurea*] in Hungary [*R.A.M.*,

xviii, p. 314] it is pointed out that any attempts at the improvement of the crop by selection must be preceded by a quantitative analysis of the alkaloid contents of individual sclerotia. The method whereby this is effected is fully described, and it is stated that some of the 800 sclerotia already examined contain over 1 per cent. total alkaloids, representing ten times the amount required in a good commercial product and over 20 times the minimum of 0·05 per cent. laid down by the German pharmacopoeia.

Scossiroli (R.). **La riproduzione della Claviceps purpurea applicata alla coltivazione.** [Reproduction in *Claviceps purpurea* applied to cultivation.]—*Riv. ital. Essenze*, xxi, 9, pp. 442–444, 8 figs., 1939.

With a view to stimulating the interest of Italian agriculturists in the extended production of home-grown ergot of rye (*Claviceps purpurea*) [see preceding abstract], the writer gives a concise account of the life-history of the fungus and briefly discusses the mode of infecting the ovaries of the flowering plants by means of ascospores from stored sclerotia. It is pointed out in this connexion that entomological studies are requisite to determine the identity of the insects which play such an important part in the propagation of *C. purpurea*, so much so, in fact, that only relatively few flowers need be exposed to primary infection by the means indicated above.

Elkin (H. A.) & White (W. A. S.). **Rot-proofing of Jute.**—*J. Text. Inst., Manchr*, xxx, 9, pp. P. 340–P. 346, 1939.

After a brief survey of the situation regarding rot-proofing of jute [cf. *R.A.M.*, xviii, p. 527], the authors express the view that there are two possible methods of treatment, (*a*) impregnation and (*b*) chemical modification of the fibre, but that to be of universal value each must include a protective action against sunlight as well.

All the better-known rot-proofing compounds tested in soil incubation tests proved to be effective in increasing the resistance of jute to micro-organisms, complete protection for all practical purposes being obtained with copper compounds (copper oleate, copper naphthenate, and commercial cuproammonium) containing over 1 per cent. copper, and with a proprietary compound containing only 0·6 per cent. copper. Zinc naphthenate also gave complete protection, yielding strikingly better results than zinc oleate, apparently owing to the action of salts of naphthenic acid. Treatment with 5 per cent. cutch solution, followed by immersion in 0·5 per cent. potassium bichromate, gave only fair protection from micro-organisms but exerted a very marked action against sunlight. Most of the other treatments exerted very little effect on the weakening of jute due to the action of sunlight.

Two satisfactory methods of impregnation are outlined, the rot-proofing compound being dissolved in a volatile solvent in one and emulsified in water in the other, and several methods of chemical modification are mentioned.

In a discussion of the subject by H. C. Bryson on pp. P. 346–P. 349 it is pointed out that the solvent employed for the solution of the preservatives exerts a great influence on the results, naphtha proving best on cotton, followed by alcohol and alcohol-naphtha mixtures.

Aluminium naphthenate is recommended as a waterproofing agent for copper naphthenate to prevent too rapid wasting of the latter under very wet conditions. Experimental treatment with copper naphthenate (commercial brand 'Concentrate') extended the life of hessian and twilled hessian from 3 to 4 to about 14 to 20 weeks and that of jute tarpaulin to between 20 and 30 weeks. It was found that two dips in a 10 per cent. solution of copper naphthenate were more effective than one in one of 20 per cent., and that about 0·04 per cent. metallic copper as naphthenate is about the minimum for effective protection. Untreated hessian, twilled hessian, and jute tarpaulin decayed when buried in a soil of a P_H value of 8·1 after 8 to 12 weeks, whereas treatment with copper naphthenate so as to give a deposit of about 0·08 per cent. of copper on the weight of the dry jute extended their life to 9 to 12 months.

In a further contribution to the discussion by J. G. Brockbank and D. A. Oury on pp. P. 349–P. 351 it is stated that although certain rot-proofing treatments tend to reduce the tensile strength of fabrics, the writers observed on several occasions that the tensile strength was increased after proofing with metallic naphthenates. High copper contents increase light tendering and the metal content should therefore be kept as low as is compatible with efficient protection. In tests with proprietary compounds manufactured from naphthenates, metal contents of 0·25 per cent. copper and 0·5 per cent. zinc gave complete protection after burying in the soil for eight weeks. The use of emulsions for impregnation is stated to require less equipment and to be more economical than that of solvents; sandbag hessian, for instance, being treated by the former method in Dundee for $\frac{7}{8}$*d.* per yd. of fabric 40 in. wide, while the corresponding cost for treatment by the latter method would be 1$\frac{3}{4}$*d.* per yd. It is believed that rot-proofed jute should be able to compete successfully with cotton or flax. Comments on the discussion are given by the authors of the original paper on p. P. 429 of part 10 of the same journal.

HAASIS (F. A.). **White streak, a virus disease of Narcissus.**—*Phytopathology*, xxix, 10, pp. 890–895, 1 fig., 1939.

White or silver streak of narcissus [*R.A.M.*, xix, p. 21], generally confused with mosaic, was first observed in commercial plantings on Long Island in 1931, having probably been present earlier. Early symptoms consist of dark green streaks, 1 to 7 or more cm. by 0·5 to 2 mm., closely associated with the vascular elements of the leaf blade. About three or four weeks after the flowering period the streaks turn white, grey, or yellowish-white and may coalesce. Similar symptoms are conspicuous on the flower stems. In forced greenhouse Bicolor Victoria plants maintained at minimum temperatures of 40°, 50°, 58°, 68°, and 80° F., late symptoms developed only at the two last, indicating that heat plays an important part in this manifestation of white streak. Affected leaves are not roughened as in the case of mosaic. The infective principle persists from year to year in vegetatively propagated bulbs; the symptoms are of the mosaic type and unconnected with any visible micro-organism; and the disease is readily transmissible from infected to healthy plants by mechanical methods,

of which Rawlins and Tompkins's carborundrum abrasive [ibid., xv, p. 737] was the most effective. For these reasons white streak is assumed to be caused by a virus. In the writer's inoculation experiments plants of the Minister Talma [daffodil: *Narcissus pseudo-narcissus*] variety, which does not appear to contract the disease naturally, were inoculated with dilute (1 in 5) sap from white-streaked King Alfred and Glory of Sassenheim leaves. No symptoms developed during the current season, but after a year's dormancy bulbs from the inoculated plants gave rise to typically white-streaked individuals (60 out of a total of 301).

Although actual proof is still lacking, observational evidence tends to support the theory that the white streak virus is closely related to that of mosaic. The two are so seldom encountered in the same plant that an immunizing effect of one against the other may plausibly be inferred.

The eradication of diseased plants and the isolation of healthy foundation plantings are the sole known methods of control.

Gregory (P. H.). **Narcissus leaf diseases. II.**—*Daffodil Yearb., 1939*, pp. 49–53, 3 figs., 1939.

A preliminary account is given of experiments carried out at different centres in west Cornwall and the Scilly Isles to ascertain the effect of the narcissus leaf diseases, scorch (*Stagonospora curtisii*) [*R.A.M.*, xvii, p. 42], white mould (*Ramularia vallisumbrosae*) [ibid., xviii, p. 598], fire (*Sclerotinia polyblastis*) [ibid., xviii, p. 32], and grey mould (*Botrytis narcissicola*) [ibid., xvii, p. 42] upon the bulb and flower crop. The results showed that crop losses may be direct or indirect. Direct losses are caused when any of these fungi pass from the foliage to the flowers. *R. vallisumbrosae* may rot the flower stalks, especially of varieties of *Narcissus poeticus*. Heavy losses of the flowers of *N. tazetta* and *N. poeticus* parentage, and also of Trumpet and Incomparabilis types may result when the perianth is spotted by spore infections by *Stagonospora curtisii*, *Sclerotinia polyblastis*, or *B. narcissicola*. Direct loss of flowers largely depends on the occurrence of weather favourable to infection when the flower buds are opening.

Indirect losses from leaf diseases are sustained when the bulb loses its foliage prematurely, as in such cases the bulbs remain small and produce fewer flowers than healthy ones.

Preliminary tests showed that *R. vallisumbrosae* and *S. polyblastis* are readily controllable by spraying the foliage with Bordeaux mixture [strength not specified] and this treatment was adopted as a standard throughout the experiments. Observations were made on the effect of spraying on bulb number, weight, grade, and flowering capacity, including flower number and quality. In a commercial stock of Golden Spur lifted after spraying for two successive seasons, it was found that bulb yield was about 40 per cent. heavier than in unsprayed, infected plots and still higher gains were recorded after three seasons. This increase in yield was due to the greater weight of individual bulbs and not to an increase in their number. The heavier bulbs gave a larger flower crop than the controls, but the difference in yield between sprayed and unsprayed plots varied considerably depending upon a number of factors. In one test a gain of 50 per cent. over the flower crop from unsprayed plots was obtained on double-nosed Golden Spur bulbs protected for

one season from *R. vallisumbrosae*, the gain after the second season rising to 70 per cent. Single-nosed bulbs gave increases of 15 and 56 per cent. over the flower crops from the unsprayed controls after the first and second seasons, respectively. As a result of an artificially induced epidemic of *R. vallisumbrosae* the flower yield of Golden Spur was reduced in the following season by 20 to 50 per cent. compared with the untreated plots. Evidence was obtained that flower crop increases of 20 to 30 per cent. can be secured on Soleil d'Or narcissus in the Scilly Isles as a result of controlling *S. polyblastis* by copper sprays. As regards flower quality, it was found that the weight of individual flowers from Golden Spur plants kept free from leaf diseases for two seasons was appreciably greater than that of untreated plants.

Under certain weather conditions considerable scorching of the leaf tip may follow applications of Bordeaux mixture, though the amount is negligible in comparison with the damage caused by fungus attack. A retardation of the date of flowering, probably extending to several days, was observed on sprayed plants of the Golden Spur variety.

Tentatively it is suggested that a single spraying after the flowers have been picked should usually suffice for control, but if the beds were heavily infected the previous year an earlier application is desirable. Sanitary measures should also be enforced.

Pickel (B.). **O mildio da Roseira em S. Paulo.** [Rose downy mildew in S. Paulo.]—*Biologico*, v, 9, pp. 192–194, 1939.

Rose downy mildew (*Peronospora sparsa*) [*R.A.M.*, xvii, p. 797] has been detected in São Paulo, Brazil, where the fungus overwinters by means of its mycelium, and not, as in cool and temperate climates, with the aid of oospores. Directions for control by prophylactic applications of standard fungicides are briefly indicated.

Santarelli (M.). **Su di una batteriosi della Violacciocca.** [On a bacteriosis of Stock.]—*Riv. Pat. veg.*, xxix, 7–8, pp. 359–365, 2 figs., 1939.

During the spring of 1939 stocks [*Matthiola incana* var. *annua*] in the Botanical Gardens at Palermo developed on the leaves small, chlorotic, irregular spots which gradually enlarged until they covered the entire leaf surface. The disease had been present in a milder form for some years. Both the plants and the affected leaves were reduced in size, the upper leaves forming a sort of rosette. The leaves also bore protuberances on the under surface, were malformed and wrinkled, and rapidly withered and fell. The development of the inflorescences was arrested, and the commercial value of the flowers was diminished. Diseased material showed the presence of a cylindrical, straight, rod-shaped organism, 4 to 6 by 0·8 to 1 μ, which was Gram-negative, reduced nitrates, coagulated milk, and fermented carbohydrates. The author considers the disease to be closely similar to that described by Briosi and Pavarino as due to *Bacterium matthiolae*, but agrees with Burkholder in regarding this organism as identical with *Phytomonas* [*Pseudomonas*] *syringae* [*R.A.M.*, xviii, p. 257].

NATTRASS (R. M.). **A new species of Phleospora on Dodonaea viscosa L. in Cyprus.**—*Trans. Brit. mycol. Soc.*, xxiii, 3, pp. 269–270, 1 pl., 1939.

In March, 1938, hedges of *Dodonaea viscosa* near Famagusta, Cyprus, developed an epidemic outbreak of a leaf spot, which appeared a few weeks later at Nicosia, about 45 miles away, and by April, 1939, had become established wherever the host was present. The affected leaves bore numerous small, black lesions, each, as a rule, with an acervulus, measuring up to 200 μ deep by 200 μ broad. The hyaline, cylindrical, curved, occasionally straight, 1- to 5- (usually 3-) septate conidia measured 50 to 90 by 3 to 5 μ, tapered abruptly at each end, had a rounded distal and truncate proximal end, and were borne on short, obclavate conidiophores arising from the lower part of the acervulus. The fungus is named *Phleospora dodonaeae* n.sp. [with a Latin diagnosis].

GERMAR (B.). **Untersuchungen über Ceratophorum setosum Kirchn. auf Lupinus albus.** [Investigations on *Ceratophorum setosum* Kirchn. on *Lupinus albus*.]—*Z. PflKrankh.*, xlix, 7–9, pp. 482–509, 9 figs., 1 map, 1939.

Ceratophorum setosum attacks the leaves, stems, pods, and seeds of white lupins (*Lupinus albus*) [*R.A.M.*, xviii, p. 655] in Germany, where attempts are in progress to extend the cultivation of this promising fodder crop. On young leaves infection assumes the form of blackish-brown spots the size of a needle-prick, which do not expand with age, though if many are present they may converge into large, dark brown, necrotic areas. In the case of older foliage the affected tissues rapidly sink and turn a dull greyish-green, the lesions developing later into circular or very irregular, dark brown, concentrically zonate areas, up to 10 mm. in diameter, on both leaf surfaces, often becoming much paler as the healthy portions of the leaf are approached. The diseased leaves wilt and may be shed. On the branches and leading shoot the lesions are elongated-oval, up to 20 mm. in length, with sharply alternating light brown and black zones. The pods show two types of infection, one characterized by deeply sunken, highly irregular spots, up to 20 mm. in diameter, at first translucent, later black and often velvety, while the other is manifested by smaller, also irregular, light brown, shiny lesions with a chestnut border. In both cases the fungus attacks the seeds, causing a brown discoloration of the seed coat, whence infection may pass to the cotyledons or the embryo and impede germination and subsequent development to a greater or lesser extent. As a rule, however, the fungus stops short at the cotyledons. Conidia are formed in profusion on the older leaves, on the stems, and especially on the black pod lesions. The germ-tubes enter the plant through the stomata and the mycelium traverses the leaf to the opposite epidermis. Chlamydospores in chains or strands may be found here and there in the invaded tissues, especially those underlying the light brown pod lesions. The growth of the fungus is intracellular, the vessels remaining free from mycelium. In the final stages the mycelium grows outwards through the stomata or epidermis and abstricts conidia.

It is estimated that up to 25 per cent. of the leaf surface of white

lupins may be infected by *C. setosum* and thereby excluded from assimilation. The weights of 1,000 healthy and 1,000 brown-spotted seeds were 329 and 263 gm. respectively, representing a loss of 20 per cent. from the disease. Even more significant is the deterioration in the quality of the infected seed, 100 five-week-old plants raised from which weighed 28 per cent. less than the normal and showed a corresponding decline in length of 23 per cent. The full economic importance of the brown spot disease cannot be gauged on the basis of the present scanty field observations, but during the last three years infection reached 100 per cent. in five East Prussian experimental areas, in one of which the cultivation of the white lupin was abandoned in consequence.

Of the various nutrient media on which the fungus was cultured, potato decoction agar was the most suitable for rapid conidial production, followed by oatflakes and oatflake-yeast-agar, while chlamydospores were abundant on carrot decoction, oatflake-glucose-saccharose, yeast-glucose-saccharose, and biomalt agars. Mature hyphae are mostly irregularly sinuous, light to dark brown, closely septate, and 7 to 13 μ in diameter. The dark-coloured chlamydospores measure 11 to 24 μ in diameter and frequently form coils which anastomose with each other and with the hyphae. The slightly curved conidia are sepia in the centre and light brown or subhyaline at the ends, 54 to 84 by 13 to 19 (average 69 by 16) μ; the apical cell bears 1 to 5, usually 3, appendages, 46 to 120 by 3 μ, which may undergo di- or more rarely trichotomous division. The conidia either arise directly from the mycelium or are borne on protuberant, sinuous conidiophores of about the same diameter as the hyphae.

The minimum, optimum, and maximum temperatures for mycelial development on malt agar were found to be 4°, 23°, and between 32° and 35° C., respectively; chlamydospore formation began at 18° and increased in abundance up to 32°. The thermal death points of the mycelium and chlamydospores were 42° and slightly above 48°, respectively (six hours' exposure). Conidial germination reached a maximum (98 per cent.) at 23° to 27°, falling to 10 per cent. at 5° and to 8 and 0 per cent. at 32° and 35° respectively.

In inoculation experiments with *C. setosum* on white lupin leaves and pods, after 36 hours the incidence of infection on the former rose from 60 per cent. at 9° to 11° to 88 at 28°, and on the latter from 0 to 75 per cent.; after 72 hours 100 per cent. was obtained at all temperatures. In germination trials the percentages of emergence of brown-spotted seed after a fortnight at 7°, 13°, and 19° were 48, 57, and 62, respectively, 14, 22, and 19 per cent., respectively, of the plants being infected, whereas the emergence of healthy seed at 13° amounted to 99 per cent. with no disease. The results of inoculations on the leaves and pods of plants 15, 25, 55, 70, and 90 days old showed the existence of strong defensive reactions in the young foliage, spore formation commencing only on plants beginning to flower, while the pods remained immune until the final phase, when they contracted heavy infection.

The host range of *C. setosum* was shown to embrace 22 species of *Lupinus*. The disease was further transmitted to *Cytisus laburnum* [*Laburnum vulgare*] and *C. capitatus*, and conversely. Of the more im-

portant hosts, *Lupinus angustifolius* showed the mildest symptoms, consisting in a brownish-purple foliar spotting of no economic significance. *L. luteus* reacts similarly to the white lupin, except that the spots are smaller and the hirsute pods seldom contract infection in the field. On *L. polyphyllus* the lesions are irregular, concentrically zonate, dark to blackish-brown with a light brown centre, up to 3 cm. in diameter. The very irregular, often confluent areas of infection on *Laburnum vulgare* and *C. capitatus* are sharply delimited, pale with an intensely dark brown border on the upper side, rust-coloured with a less dark edge below. Premature defoliation may occur in severe attacks.

During the growing period infection is spread by means of the conidia, the production of which reaches a climax on the ripening pods, so that widespread dissemination may be expected from mid-July onwards. Only two observations have been made on the range of the conidia, in which they failed to cover distances of 200 and 400 m., respectively. As regards overwintering, heavily infected *Lupinus polyphyllus* plants put out completely healthy leaves and inflorescences in the following spring, but early in July a severe attack commenced at the base, evidently originating in fallen diseased leaves of the previous season. On infected white lupin pods overwintered indoors the conidia were still viable to the extent of 80, 45, and 7 per cent. in the following May, July, and September, respectively, whereas the viability of those left in the open amounted to only 1 per cent. in February and nil in March. New conidia, evidently arising from chlamydospores, were produced in abundance at the end of May.

A study of the distribution of *Ceratophorum setosum* in Germany showed it to be largely confined to the eastern regions, where the prevailing climatic conditions are possibly not altogether congenial to the white lupin. Another factor to be considered is the widespread occurrence in the forests of the affected zone of *L. polyphyllus*.

In seed disinfection tests the best results were given by dusting with ceresan, which increased the emergence of severely diseased seeds from 46 to 74 per cent. and reduced the incidence of infection from 12 to 8 per cent. The emergence of seeds immersed for 40 minutes in 0·1 and 0·2 per cent. ceresan was 66 and 64 per cent., respectively, and the infection percentages 8 and 4, respectively. A considerable reduction of pod-spotting was obtained by the application of 1 or 1·5 per cent. Bordeaux mixture on 15th July. Early sowing (14th April) was found to promote resistance to *C. setosum*. Early harvested seeds (a fortnight before the usual time) showed 69 per cent. emergence and 6 per cent. infection compared with 39 and 9 per cent., respectively, for the normal date.

JONES (F. R.). **Evidence of resistance in Sweetclover to a Phytophthora root rot.**—*Phytopathology*, xxix, 10, pp. 909–911, 1939.

A sweet clover [*Melilotus*] root rot occurring in Ohio, Indiana, Illinois, Wisconsin, and elsewhere in the United States is characterized by a soft, watery decay extending downwards from the crown for a distance of up to 8 in., followed by desiccation, shrinking, and discoloration of the affected tissues and accompanied in hot spring weather by wilting of the plants. The disease, which is caused by a *Phytophthora* identified by Drechsler as *P. megasperma* [*R.A.M.*, xi, p. 303; xvii,

p. 476; xviii, p. 646] is most prevalent in damp, low-lying sites in the field or near the roadside, and mainly attacks young, poorly developed plants. In inoculation experiments carried out in connexion with a search for resistant strains infection took place with equal severity over a soil temperature range of 10° to 24° C. The most convenient method was to introduce mycelium from an agar culture below the bark of roots stored in sand in a cold frame from the late autumn until January or after. When the rot is sufficiently advanced for the roots to be sorted, the survivors are given a second inoculation and set in soil. So far the only resistant plants have been obtained from a few selected strains of white sweet clover [*M. alba*], including one of foreign origin. Thirteen of the progenies from selfed seed of the resistant selections sown in 1938 yielded 50 to 75 per cent. healthy plants compared with only 10 per cent. from the offspring of an unselected sister plant, so that resistance to the root rot can evidently be appreciably increased by this means.

JONES (F. R.). **Four fungus parasites of Sweetclover infecting seed.**—*Phytopathology*, xxix, 10, pp. 912–913, 1939.

In addition to the causal organism of stem blight (*Ascochyta caulicola*) [*R.A.M.*, xviii, p. 35], sweet clover (*Melilotus*) seed in Wisconsin bore *Cercospora zebrina* (?) [ibid., xvii, p. 507], *Leptosphaeria pratensis* (*Stagonospora meliloti*) [ibid., xv, p. 632], and *Mycosphaerella lethalis* [ibid., xviii, p. 35]. The examination of 27 samples from farms in the State germinated on potato dextrose agar showed 13 to be infected by the *Cercospora* and six each by *A. caulicola* and *S. meliloti*. No external evidence of their presence in the seed was detected, nor did they appear to cause any direct damage to the seedlings. The *Cercospora* fruited profusely on the discarded seed coat in five to seven days at room temperature. *M. lethalis* did not occur in these commercial lots, but was isolated from seed of severely infected *Melilotus dentata* plants in an experimental plot.

RODIGHIN (M. N.) & PETROFF (P. A.). Вилт, или увядание Донника и Люцерны. [Wilt of Sweet Clover and Lucerne.]—'25 years of Saratoff Agricultural Institute', Saratoff, pp. 176–185, 1939.

A wilt and root rot of white sweet clover (*Melilotus alba*) is responsible in part for the low yields of this crop in south-eastern Russia. The disease was observed near Saratoff, where it caused a stunting of the plants, which produced small, discoloured leaves, sometimes curled and mottled. Affected plants usually died within two years. Bacteria were found in the vascular bundles and adjacent tissues. From the diseased tissues was isolated a bacterium which is identified as *Bacterium radiciperda* [*R.A.M.*, xi, p. 652], the only divergence from the description of the type being the size of the rod (1·2 to 2 by 0·4 to 0·6 μ) and the apparent absence of flagella. It was capable of growing on most media except Cohn's and of decomposing starch; in bouillon growth was cloudy, with a white pellicle, later turning yellow, causing the formation of a precipitate. An unidentified species of *Fusarium* was a frequent secondary invader of wilted plants and is said to be responsible for an intensified decay of the root system.

Among the standard varieties of sweet clover from the Saratoff Selection Station tested in the field, 19 were resistant, while others ranged from medium to very susceptible. A wilt of lucerne observed in the same vicinity also yielded the same bacterium.

TEHON (L. R.). **Two new fungi on legumes.**—*Mycologia*, xxxi, 5, pp. 537–543, 1 fig., 1939.

Descriptions, with Latin diagnoses, are given of two new pathogenic fungi in Illinois, *Placosphaeria medicaginis* n.sp. on leaves of lucerne, and *Catosphaeropsis caulivora* n.g., n.sp. on stems of *Lespedeza stipulacea* [*L. striata*]. Both the diseases are stated to be of limited economic importance, lowering the vigour of the host plants but having little effect on the yields. *P. medicaginis* affects the lucerne leaves at one or more points, most commonly on one side of the mid vein only, the lesions turning yellow and the entire leaf blade assuming finally a corrugated appearance. Within the infected regions small, black areas develop, bearing multilocular stromata up to 1 cm. long. The locules are amphigenous, spherical or flattened, mostly single but often confluent and then appearing to be compound, measuring 75 to 140 μ in width and 75 μ in height; no true ostioles are formed. The spores are oblong, hyaline, and confluent, 3 to 7 by 1·5 to 2 μ.

The disease on *Lespedeza* is characterized by lesions which at first appear as elongated, dark-coloured areas between the nodes of the stem and on the lateral branches. Eventually all parts of the plant lying beyond the stem lesion are killed. Minute, shining, black pycnidia, 120 to 200 μ in diameter, develop on the lesions, often in longitudinal rows, and about the same time the leaves drop off. The pycnidia are rather more than hemispherical, with an incomplete base; at maturity the papilla breaks off, leaving an irregularly circular pore, up to 25 μ in diameter. The walls are membranous and the conidia-bearing layers are borne at the dome; the conidia are brown, continuous, oblong to ovate or tapering to the base, and measure 16 to 27 by 9 to 12 μ. Although the fungus resembles *Sphaeropsis* in many of its characters, it is, in the author's opinion, more accurately placed in the Leptostromataceae on account of the incompleteness of its pycnidium and its inverted method of sporulation. A new genus is consequently erected within this family for the species.

VIDAL (J. L.). **A propos du traitement contre la chlorose calcaire des arbres fruitiers.** [On the treatment of lime-induced chlorosis of fruit trees.]—*Progr. agric. vitic.*, cxii, 48, pp. 394–396, 1939.

The information in this paper has already been noticed from another source [*R.A.M.*, xvii, p. 472].

HENRICK (J. O.). **Apple black spot (Venturia inaequalis) investigations. Eradicant experiments—preliminary report.**—*Tasm. J. Agric.*, N.S., x, 3, pp. 150–151, 1939.

In preliminary tests carried out in Tasmania in the winter of 1937 thirteen lots of apple leaves heavily infected with *Venturia inaequalis* [*R.A.M.*, xvii, p. 118; xviii, p. 236] were sprayed in the laboratory with, respectively, urea, sulphate, chloride, and carbonate of ammonia,

sulphate and chloride of potash (all at rates of 1 and 2 lb. per gal.), and commercial lime-sulphur (1 in 8), and placed in a spore trap box out of doors. The treated leaves yielded no ascospores, though untreated control leaves in similar boxes discharged ascospores on four occasions during the progress of the experiment.

In the winter of 1938 leaves in infected orchards were sprayed with either sulphate of ammonia or sulphate of potash (10 and 20 per cent.), lime-sulphur (1 in 8), chloride of ammonia (5, 10, and 15 per cent.), or chloride of potash (at similar strengths). No ascospore discharge took place from the treated leaves, though discharges occurred from the untreated controls. Dry weather prevailed and the treatments require further testing under wet and normal conditions.

Control of black spot of Apples and Pears.—*Fruit World, Melbourne*, xl, 9, p. 7, 1939.

The Department of Agriculture of Victoria has issued the following modified spray programmes for the control of black spot [scab] of apples [*Venturia inaequalis*: *R.A.M.*, xvi, p. 187] and pears [*V. pirina*: ibid., xviii, p. 744]. Schedule 1 is recommended for apple varieties liable to russet, such as Jonathan, London Pippin, Yates, Rokewood, and Gravenstein: Bordeaux mixture 6–4–40 at the green tip stage (slightly earlier for Jonathan), lime-sulphur $2\frac{1}{4}$–80 at the '5 to 10 per cent. blossom' stage, $1\frac{1}{2}$–80 at petal fall, and 1–80 a fortnight later. Schedule 2, recommended only for apple varieties which do not russet easily: Bordeaux mixture 6–4–40 at the green tip stage, 3–3–50 at the 'finger' stage (blossom buds beginning to separate) but not later. If late summer scab appears, 6 oz. each of copper sulphate and freshly slaked lime should be included in each 80 gals. of lead arsenate or white oil sprays, or lime-sulphur, if preferred, should be used at a strength of 1–80.

Recommendations for the control of scab on various pear varieties are as follows: for Williams, Beurré Bosc, Winter Nelis, and Madame Cole, Bordeaux mixture 6–4–40 at the delayed green tip and finger stages, and 3–3–50 with lead arsenate at the late calyx stage, but for the two last-named varieties the second spray must be completed before any petals show pink, and the third must not be applied within three weeks after petal fall; for Josephine and Winter Cole Bordeaux mixture 6–4–40 at the early green tip stage only; and for Packham's [Triumph] and other clean-skinned varieties Bordeaux mixture 6–4–40 at the delayed green tip and finger stages, and 1–1–50 (with lead arsenate) at the late calyx stage. Should summer scab appear, Bordeaux mixture 1–1–50 can be applied to Williams, Beurré Bosc, and Packham's Triumph; for Josephine 6 oz. each of copper sulphate and slaked lime can be added to each 80 gals. of lead arsenate sprays.

Rosella (E.). **La lutte contre les ennemis des arbres fruitiers.** [The campaign against fruit tree pests.]—*Vie agric. rur.*, xxix, 9, pp. 377–381, 1939.

Apricots and peaches are stated to have been severely attacked in France during the damp season of 1939 by *Coryneum* [*beijerinckii*: *Clasterosporium carpophilum*: *R.A.M.*, xii, p. 301], causing severe

gummosis and subsequent desiccation of the twigs, for the control of which dormant treatments of 2–2–100 Bordeaux mixture are recommended for both fruits, supplemented by summer sprays of copper oxychloride (200 to 300 gm. per 100 l. for peaches and 500 for apricots, the latter also responding favourably to 1–1–100 Bordeaux mixture). *Monilia* [*Sclerotinia fructigena* and *S. laxa*] (particularly injurious to apricots, though also attacking peaches and other stone fruits) [ibid., xvi, p. 389] may likewise be combated by copper-containing sprays applied (a) just before the renewal of growth, (b) immediately prior to the opening of the flower buds, and (c) after blossoming.

For joint control of apple or pear scab [*Venturia inaequalis* and *V. pirina*] and *Carpocapsa* [*pomonella*] the writer advocates two applications of 1–1½–100 Bordeaux mixture (or ¾–1to1½–100 for apple varieties susceptible to russeting) mixed with 500 to 1,000 gm. lead arsenate and 1 l. skimmed milk or ¾ to 1 l. white oil per 100 l. mixture, the first to be given at or shortly after the blossom and the second at the end of May in the south, beginning of June in the Paris region, and end of June in the central plains, the latter treatment being the more important. Copper oxychloride (500 gm. per 100 l.) may be substituted for Bordeaux mixture if desired.

SMITH (W. H.). **Physiological breakdown in stored Monarch Plums.**—*J. Pomol.*, xvii, 3, pp. 284–291, 3 graphs, 1939.

Plums of the variety Monarch, stored at East Malling, Kent, at temperatures from 31° to 65° F. and for periods varying from 7 to 64 days, developed the minimum percentage of physiological breakdown [*R.A.M.*, xvii, p. 469] at 34°, a rapid rise taking place both above and below this temperature. The maximum percentage of breakdown after 14 to 21 days of storage occurred at intermediate temperatures, but after longer periods the maxima occurred at progressively lower ones. The effect of a greater degree of maturity at picking was to advance the time of the first appearance and maximum development of breakdown at each of the temperatures tested. The disorder appeared either as jellying, which was found only in plums stored at 37° or above, or as internal browning occurring in those stored at 31° and 34°. In plums disposed to jellying the flesh becomes relatively dry and mealy during the softening process, this condition being sometimes limited to a portion of the flesh, which becomes dark and injected. In advanced stages of jellying a ring of whitish, spongy tissue, in which numerous gas bubbles are present, frequently develops round the stone. Internal browning first appears as brown flecks radiating outwards from the stone; later the vascular strands become discoloured and browning becomes general, although frequently a ring of comparatively sound tissue is found beneath the skin. It is suggested that these are two distinct types of injury with probably different causal relations.

ARRUDA (S. C.). **'Mal do Panama' en 'Bernardino de Campos'.** [Panama disease in Bernardino de Campos.]—*Biologico*, v, 9, pp. 198–199, 1939.

Attention is drawn to the occurrence in Bernardino de Campos, Brazil, of Panama disease of bananas (*Fusarium oxysporum cubense*),

which has already decimated the extensive plantings in the municipality of Piracicaba (São Paulo) [*R.A.M.*, xvii, p. 50]. The symptoms of the disease are briefly described and control measures indicated.

MAGEE (C. J.). **Improved control methods for squirter and black end.**—*Agric. Gaz. N.S.W.*, l, 10, p. 564, 1939.

Experimental evidence has shown that a slight improvement in the case-dip method of controlling banana squirter disease [*Nigrospora sphaerica*: *R.A.M.*, xviii, p. 327] and black end [*Gloeosporium musarum* and *Fusarium* spp.: loc. cit.] may be effected by substituting the soluble powder, shirlan W.S., for shirlan A.G. The former leaves no deposit. It costs 9*s*. 6*d*. per lb. in New South Wales, as against only 4*s*. 6*d*. per lb. for shirlan A.G., but ½ lb. suffices for 30 gals. of dipping solution as against 1½ lb. of shirlan A.G. To render shirlan W.S. suitable for dipping bananas, a wetting agent, such as agral 2 (2 oz. per ½ lb. shirlan W.S., cost about 6*d*.), should be added. The cost of materials for treating 40 cases with shirlan W.S. squirter dip works out at 5*s*. 3*d*. as against 6*s*. 9*d*. for shirlan A.G. Any grower who has ever had a complaint about either disease in his consignments should adopt dipping as a routine procedure during the colder months of the year.

MAGEE (C. J.). **Control of Banana leaf spot and related diseases.**—*Banana Bull., Sydney*, i, 40, pp. 11–12, 1939.

Further investigations on the possibilities of controlling banana leaf spot (*Cercospora*) [*musae*] by the application of fungicidal sprays in the Tweed and Brunswick districts of New South Wales [*R.A.M.*, xviii, p. 264] have led to the development of a programme involving monthly treatments from December to April with cuprous oxide or copper oxychloride, both of which are equally effective with, and more convenient than, Bordeaux mixture. From 70 to 100 gals. per acre will be required for each treatment, and in most plantations on steep hillsides the most practical method of application will be by means of a bucket pump feeding two 30 ft. lengths of ¼ in. pressure hose, the estimated total cost of a treatment being reckoned at 25*s*. to 35*s*. per acre. Good control may also be obtained by thorough coverage of the plants with basic copper sulphate dusts.

MAGEE (C. J.). **Control measures outlined. Leaf spot and speckle in Bananas.**—*Banana Bull., Sydney*, i, 41, pp. 3, 13, 1 fig., 1939.

Following a recent survey of the banana plantations in the Tweed district of New South Wales, the writer briefly describes the symptoms and modes of infection of leaf spot (*Cercospora musae*) [see preceding abstract] and speckle [ibid., xiv, p. 216] (believed to be due to red spider [*Tetranychus telarius*]) and outlines the following programme for their control. At monthly intervals from December to April all plants expected to bunch from January to May should be sprayed with a suspension of copper oxychloride (1½ lb. to 40 gals.) and colloidal sulphur (1 lb. in 40 gals.). The March and April treatments should include plants which will bunch during June, July, and August. The spray should be applied to the under side of the two youngest leaves and to the heart leaf, taking care that the pipe or funnel leaf is reached.

Bordeaux mixture (1–1–10) may be substituted for copper oxychloride in plantations where its preparation presents no difficulties. Alternatively, the plants may be dusted with a mixture of 20 per cent. basic copper sulphate and 40 per cent. sulphur, or with a cheaper home-made preparation of 7 lb. basic copper sulphate or copper oxychloride and 14 lb. each of fine sulphur and superfine hydrate of lime.

Darrow (G. M.) & Waldo (G. F.). **Strawberry varieties in the United States.**—*Fmrs' Bull. U.S. Dep. Agric.* 1043, 29 pp., 6 figs., 4 maps, 1939.

This bulletin (a revised edition of one originally prepared by the first-named author in 1919) contains notes on varietal resistance to disease and 'running-out' of strawberries in the United States. More or less satisfactory resistance to grey mould (*Botrytis*) [*cinerea*] is shown by the Sample, Chesapeake, and Aroma varieties. Leaf spots [*Mycosphaerella fragariae* and other fungi: *R.A.M.*, xviii, p. 402], which are stated to be specially destructive in the south, do not appreciably affect Chesapeake, Howard 17, Blakemore, Fairfax, Dorsett, Catskill, and Rockhill. Mildew [*Sphaerotheca humuli*] is occasionally troublesome on Late Stevens, Gandy, and Clark, but generally speaking is of no great importance on the commercial varieties in common cultivation. Marshall has been largely replaced in California by Nick Ohmer owing to the resistance of the latter to yellows [xanthosis: loc. cit.]. Aberdeen is immune from, and Pathfinder, Mastodon, and Redheart resistant to, 'red stele' root rot [*Phytophthora*: ibid., xviii, p. 123]. In nearly all sections fungal rots have played a prominent part in 'running-out', while virus diseases are also implicated on the Pacific coast and possibly in the eastern States.

Nattrass (R. M.). **A preliminary note on the 'woodiness' disease of Passion Fruit in Kenya.**—*E. Afr. agric. J.*, v, 2, pp. 130–133, 1939.

In the Trans Nzoia district of Kenya the woodiness disease of passion fruit recorded in 1936 [*R.A.M.*, xvi, p. 796; xviii, pp. 727, 748] has now assumed alarming proportions. Locally the fruit symptoms vary considerably, being influenced by the stage of development reached when the disease takes effect, the environmental conditions, and, apparently, the strain of the virus involved, but typically affected fruits are misshapen and show a thickened woody pericarp and a reduced pulp cavity. The foliage symptoms vary so widely that identical symptoms are seldom seen in different plantations.

Direct measures of control recommended consist in planting healthy material, destroying diseased plants, and the avoidance of passing on the disease during handling and pruning. Planting material should be raised from seed on the farm as far away as possible from other passion fruit. The nursery must be frequently inspected, and no plants should be used from any nursery once it has become affected. The successful eradication of diseased plants largely depends on the recognition of the disease in its earliest stages. The first diagnostic symptoms appear on the youngest foliage before the fruit is affected. Diseased plants should be cut off at ground-level and immediately burnt or scorched on the spot. Where the disease is known to occur, the leaders should be

stopped before meeting along the wires. Gaps may be replanted only when it is certain that the disease has been successfully eradicated from the plantation and no cases have occurred within three months.

Taylor (G. G.). **Application of orchard sprays.**—*Bull. N.Z. Dep. sci. industr. Res.* 23, 46 pp., 29 figs., 20 graphs, 1939.

The papers composing the four parts of the present bulletin and dealing, respectively, with the stationary spray system, the portable system, spray nozzles, and spray coverage have already been noticed from another source [*R.A.M.*, xvi, p. 824].

Trinchieri (G.). **Pour l'établissement d'une liste internationale de préparations antiparasitaires agricoles d'une efficacité reconnue.** [For the establishment of an international list of agricultural antiparasitic preparations of recognized efficacy.]—*Chron. bot.*, v, 4–6, pp. 428–429, 1939.

The views expressed in this paper have already been noticed from another source [*R.A.M.*, xviii, p. 506].

Atti e Communicazioni IV Congresso internazionale di Patologia comparata, Roma, 1939. [Proceedings and communications of the Fourth International Congress of Comparative Pathology, Rome, 1939.]—455 pp., 36 pl., 6 figs., 7 graphs, 2 maps, 1939.

The following papers occur in this report.

C. Sempio (pp. 355–366), writing on the problem of resistance in plant pathology (Aspetti del problema della resistenza in patologia vegetale), distinguishes between two forms of active protoplasmic resistance in higher plants to bacterial and fungal attack. One is toxicological, and results from the presence in the tissues of regressive products and, particularly, of specific toxins, elaborated or absorbed by the plant, while the other is metabolic, and consists in an acceleration or retardation of metabolism, resulting in the soluble components of the protoplasm being rendered less attractive to the parasite, which becomes weakened through lack of food.

When Frassineto wheat seedlings were grown in a nutrient solution containing cadmium nitrate, or in a nutrient solution and cadmium nitrate alternately, and were inoculated with a conidial suspension of *Erysiphe graminis*, the epidermal cells developed strong resistance to the penetration and development of the fungus, as compared with the untreated, inoculated controls, this effect being shown to a varying though less extent by other wheat varieties.

In experiments on metabolic resistance inoculated seedlings of the same varieties were exposed continuously to light for a period of nine to ten days immediately following inoculation, and the protective effect of the light against infection (as compared with plants kept in darkness for all or part of the same period) was most marked during what the author terms the first period of infection [*R.A.M.*, xviii, p. 471]. There was no appreciable difference in this respect between the varieties. As conidial germination was unaffected by exposure of the plants to light, the increased resistance is attributed to a continuous process of synthesis. Both the plants receiving cadmium and those exposed

continuously to light showed the presence in the epidermal cells of characteristic granulations.

V. Rivera (pp. 369–371) discusses the arrest or slowing down of metabolism as a necessary predisposing factor in infection. Experimental infections with Erysiphaceae showed that epidemics do not develop if the host cells are in a state of maximum turgidity; if this turgidity is artificially reduced, even to a slight extent, for example by suspending irrigation or putting in the sun plants grown in the shade, then intense infection will develop. In general, environmental conditions predisposing the host plant to infection are contrary to those which favour the development of the parasite, and vice versa.

The same author (p. 372) also briefly refers to the present state of knowledge concerning the action of metals at a distance on healthy and diseased plant tissues [ibid., xvi, p. 399].

Helena L. G. De Bruyn (pp. 373–374), in a note on marsh spot of pea seed as caused by manganese deficiency, gives a condensed account of work already noticed from another source [ibid., xviii, p. 777].

T. H. Thung (pp. 375–378) briefly discusses the possibility of immunizing tobacco and potato plants against virus diseases [ibid., xvi, p. 414], pointing out that the protective action of the virus of ordinary tobacco mosaic is stronger than that of most of the other sap-transmissible, thermostable viruses of tobacco, but that it gives no protection against subsequent infection with insect-transmissible tobacco viruses. Neither does the presence of the latter afford protection against the former. Viruses conferring protection against insect-transmissible tobacco viruses have not yet been found.

The protective vaccination of potatoes has given promising results, but the method has certain dangers, i.e., infection may spread to other varieties in the vicinity, mild strains may mutate to more highly pathogenic ones, and the vaccinated plants may contract diseases due to other viruses, which, in combination with the virus already present, may produce serious infection.

J. Dufrénoy (pp. 379–381, 4 figs.) states that the brown or black discoloration in the tissues of plants affected by virus diseases may be due to the formation of melanin or related materials from catechol or other diphenols, such as tyrosine derivates, by the agency of oxidases. The discoloration may be recognized by a change in the chloroplasts, which swell and finally develop into a brown mass.

Dufrénoy, H. S. Reed, and Sempio, discussing lipid degenerescence in plant cells (pp. 383–384), state that the complex lipid inclusions in plant cells of living tissues can be stained orange-red by immersion in a solution of sudan III. In healthy cells the lipids are arranged as small drops in the cytoplasm, but in the presence of pathological influences they become aggregated.

Investigations over several years at Wageningen, Holland, by H. M. Quanjer and his students (pp. 385–387) on the effect of different viruses and soil deficiencies on the health of potato plants [ibid., xviii, p. 545] have shown that each individual virus and each specific deficiency of an element causes particular external and internal symptoms. The characteristics of six virus and ten deficiency diseases are tabulated. Each virus interferes with a particular function, and each element plays

a specific part in the physiological activity of the plant. Of the deficiency diseases, those due to lack of nitrogen, potassium, phosphorus, calcium, magnesium, manganese, iron, and boron are said to occur in slight intensity in ordinary potato fields; those due to copper and zinc have so far only been produced experimentally.

CRAFTS (A. S.). **Movements of viruses, auxins, and chemical indicators in plants.**—*Bot. Rev.*, v, 9, pp. 471–504, 1939.

This is a fully documented review of the available knowledge of the subject.

MELHUS (I. E.) & KENT (G. C.). **Elements of plant pathology.**—x+493 pp., 259 figs., New York, The Macmillan Company, 1939. 21*s*. net.

In this elementary text-book the main emphasis has been placed on the phenomena of parasitism in disease processes and the mycological aspects have been minimized. The first seven chapters are devoted to matters of general interest and are followed by nine chapters dealing separately with about 60 diseases due to fungi, bacteria, viruses, or other agencies, essential information on the occurrence, symptoms, cause, and control being given for each disease treated. The book is well illustrated and forms an excellent introduction to the subject of plant pathology.

VEREȘCEAGHIN (B. V.). **Patologie vegetala. Protecția plantelor agricole.** [Plant pathology. Protection of crop plants.]—210 pp., 49 figs., Chişinău, Tipografia 'Tiparul moldovenesc', 1939. 90 lei.

In the part of this Rumanian text-book dealing with plant diseases (pp. 138–202) brief descriptions are given on the diseases of the more important crops with notes on their control.

RAMSEY (G. B.). **Fruit and vegetable diseases on the Chicago market in 1938.**—*Plant Dis. Reptr, Suppl.* 114, 40 pp., 1939. [Mimeographed.]

Brief notes are given on the fungal, bacterial, virus, and physiological diseases of fruit and vegetables observed in the Chicago market in 1938 [*R.A.M.*, xviii, p. 35], and some data are added on the field and market diseases of Californian tomatoes.

COOK (M. T.). **Enfermedades de las plantas economicas de las Antillas.** [Diseases of economic crops in the Antilles.]—*Monogr. Univ. Puerto Rico*, Sér. B., 4, 530 pp., 1 pl., 171 figs., 1939. $2.00. [Obtainable from the Book Store, University of Puerto Rico, Rio Piedras, Puerto Rico.]

This is a useful text-book on diseases of cultivated plants in the Antilles. Following an introductory section, the author deals with the diseases of sugar-cane (138 pp.), citrus (64 pp.), banana (38 pp.), cacao (16 pp.), and a large number of other hosts, descriptions being given of the symptoms, the causal agents, and the methods of control for the more important pathogens. A glossary of 19 pp. is appended.

WEAN (R. E.) & YOUNG (J. E.). **Renewed liquid-cultures of fungi.**—*Phytopathology*, xxix, 10, pp. 895–898, 1 diag., 1 graph, 1939.

The writers describe the construction and application of an apparatus

for the automatic regulation of the renewal of liquid nutrient medium from a 6 l. Pyrex flask reservoir by siphoning into a series of flask cultures. The apparatus is of value in physiological studies on fungus growth.

CAPPELLETTI (C.). **Il ricambio dell' azoto in Corticium catonii Burg.** [The nitrogen exchange in *Corticium catonii* Burg.]—*Nuovo G. bot. ital.*, N.S., xlvi, 3, pp. 510–519, 1939.

The author states that experiments carried out by him showed that under the given conditions the orchid symbiont, *Corticium catonii* [*R.A.M.*, xi, p. 317], was unable to fix atmospheric nitrogen; on the contrary, when growing on nitrogenous media, especially nitric nitrogen, it released nitrogen.

SALAMAN (R. N.). **Potatoes: a retrospect. 1918–1938.**—*J. nat. Inst. agric. Bot.*, iv, 4, pp. 422–432, 1939.

In an address delivered at the Seventeenth Annual General Meeting of Fellows of the National Institute of Agricultural Botany at Cambridge in 1938 the author reviews the work done by the Institute during the years 1918 to 1938 in connexion with potato diseases. It is stated that in most years from 30 to 50 per cent. of the potato crop of England is severely infected with virus diseases, the losses amounting to at least 1,000,000 tons a year [*R.A.M.*, xvi, p. 770]. None of the existing potato varieties is immune from, or even fairly tolerant of, the virus of leaf roll, although Great Scot and Up-to-Date are more resistant than others; and none is immune from leaf drop streak (virus Y), although a varying degree of susceptibility is exhibited, and Ulster Monarch and Edgecote Purple are almost tolerant [ibid., xviii, p. 132]. There is no hope at present of breeding a variety immune from virus Y, and the key to the problem of control lies, therefore, in the use of clean seed. The author emphasizes the importance of introducing into the breeding stocks blood from wild and even unrelated tuber-bearing species of *Solanum* [ibid., xvii, p. 200; xviii, p. 410]. He considers that the highest possible production of potatoes can only be obtained by the use of virus-free seed in large quantities, and by the use of varieties tolerant of virus infection and frost in the ware districts.

NOLL (A.). **Untersuchungen über die Biologie und Bekämpfung des Kartoffelschorfes (Actinomyces).** [Studies on the biology and control of Potato scab (*Actinomyces*).]—*Landw. Jb.*, lxxxix, 1, pp. 41–113, 2 figs., 1 graph, 1939.

This is an exhaustive, fully tabulated account of the writer's studies at the Landsberg (Warthe) Agricultural Experiment Station, Germany, in 1936–7, on various aspects of potato scab (*Actinomyces* spp., including *A. scabies*) [*R.A.M.*, xix, p. 42].

The differences between the excrescences characteristic of the various types of scab—shallow, deep, and pustular—were found to depend mainly on the amounts of dead adhering or detached parenchyma and of newly formed parenchyma tissue below the terminal layer of wound cork, and on the extent and nature of the fissure development induced by tension in the surrounding tissues.

Differences in varietal reaction to the disease were apparent even in the early stages of tuber growth and as a rule became even more marked as the season advanced, though a few instances of partial recovery were noted, especially in 1937. Among the more resistant varieties [ibid., xvii, p. 413, 483] in both years was v. Kameke 447/40 (shallow type of infection); in 1936 promising results were also obtained with v. Kameke 477/31, Weisses Rössl (shallow), Graf Dürkheim 152/29 (shallow to deep), and Nordost 19/2957 (shallow to pustular), and in 1937 with Frühauf (shallow), v. Moreau WBH 8 (? pustular), v. Kameke 469/02 (shallow), Juli (deep), and Speisegelb (pustular). The type of scab was observed to depend, not only on the variety, but on the place of origin, which tended to modify the natural reaction, and the stage of development of the tubers, those in the juvenile phase being almost exclusively affected by the shallow form. On the other hand, no correlation was apparent between scab types and soil or climatic conditions and the time of ripening.

The pre-eminent importance of soil infection, already emphasized by previous workers, was again conclusively demonstrated by the admixture with the soil of ground scab excrescences. In inoculation experiments on sterilized Rosafolia tubers with various *A.* species (including Wollenweber's *A. incanescens*, *A. tricolor*, and *A. intermedius* [ibid. i, p. 183; xi, p. 25]) and strains and bacteria, only the writer's 1a, isolated from several varieties, gave absolutely conclusive results; it is characterized by regular hyphae, 0·5 to 1 μ in diameter, a loose, yellowish-brown mycelium, and conidia 1·8 by 0·8 μ.

Protection of the tubers against scab infection was conferred by the closure of the lenticels through suberization, by suberization of the skin and of the surface of wound tissue, as well as by the absence of fissure formation. The incidence of infection was correlated with (1) planting time, later dates (from 18th May to 28th July) being more favourable to the health of the stand than earlier ones; (2) soil moisture; and (3) place of origin. On severely infested soil (loamy sand) the amount of infection was appreciably reduced by timely watering; on the same soil in the greenhouse the minimum, optimum, and maximum water contents for the development of the disease were shown to be 15, 20, and 35 per cent., respectively, no scab occurring at 40 per cent. Most of the 47 varieties showed differences in their reactions to scab correlated with their eight places of origin, Parnassia and Industrie being notable exceptions to this rule.

No influence on the degree of infection was exerted by the extent of intumescence formation on the tuber, growth rate of the tubers, the resumption of development after temporary cessation, or the hydrogen-ion concentration of the soil. Important factors in varietal reaction were the amount of infection on the underground stem, freedom from which was in general (but not consistently) correlated with soundness of the tubers; the anatomical structure of the lenticels, the 'protection' of which by cork cells and other means of excluding the pathogen is normally associated with resistance, e.g., in Erdgold, Ackersegen, Hindenburg, Edelragis, Jubel, Treff As, and Berlichingen; and the capacity for wound periderm formation, activity in this respect connoting susceptibility to scab.

KÖHLER (E.). **Über die X^E Gruppe des Kartoffel-X-Virus.** [On the X^E group of the Potato X virus.]—*Zbl. Bakt.*, Abt. 2, ci, 1–3, pp. 29–40, 7 figs., 1939.

This is an expanded version of the writer's studies at the Biological Institute, Dahlem, Berlin, a preliminary account of which has already appeared [*R.A.M.*, xviii, p. 409]. The present paper defines the position of various aberrant and derivative strains, isolated from inoculated tobacco leaves within the two categories X^E and X^N. To X^E (inactivated after ten minutes at 75° C.) belong Ers 25, Ers 34 (a feeble variant of the foregoing), Mix B (a powerful variant of Ers 25), Bm (a derivative of Mix B identical with Ers 25), Bs (another derivative of Mix B, stronger than Bm), and a necrotic strain Bf. X^N (inactivated at 68°) comprises most, or probably all, the other X strains investigated by the author, including those of the Cs type [ibid., xvii, p. 561; xviii, p. 543].

PEYRONEL (B.). **Alcune osservazioni e considerazioni sulla biologia di Hypochnus solani Prill. et Del. in rapporto all' importanza dei funghi per l'ecologia e la distribuzione geografica delle piante superiori.** [Some observations and considerations on the biology of *Hypochnus solani* Prill. & Del. in relation to the importance of fungi in the ecology and geographical distribution of the higher plants.]—*Nuovo G. bot. ital.*, N.S., xlvi, 2, pp. 319–323, 1939.

Rhizoctonia [*Corticium*] *solani* was found causing root rot of *Thlaspi rotundifolium*, *Gypsophila repens*, and *Oxytropis foetida* in a garden situated in the Alps at an altitude of 2,200 m. [*R.A.M.*, xvii, p. 264] in which potatoes have never been planted. Infection was also found on a number of apparently healthy wild plants in the Alps and was observed severely affecting *Polygonum persicaria*. The author concludes that *C. solani* is probably part of what he regards as the 'normal (and particularly root-inhabiting) fungal flora'. This flora is of great importance in the ecology and geographical distribution of the higher plants.

BONDE (R.). **Comparative studies of the bacteria associated with Potato blackleg and seed-piece decay.**—*Phytopathology*, xxix, 10, pp. 831–851, 1939.

A considerable proportion of the 62 bacteria found associated with potato blackleg, seed-piece decay, and soft rot in Maine and South Carolina, besides showing strong mutual similarities and a capacity for causing both blackleg and soft rot, were indistinguishable from authentic cultures of *Erwinia carotovora* [*R.A.M.*, xviii, p. 412], which name the writer, in conformity with J. G. Leach, prefers to *E. phytophthora* [ibid., x, p. 125]. Physiologically the cultures were nearly alike except in their gas and indol production relationships, some from both States evolving no gas on dextrose, sucrose, or lactose, others producing it on all three sugars, and five on lactose and sucrose but not on dextrose; eleven (all of the blackleg and soft rot groups) yielded indol on the application of the Kovàks test only. The separation and classification of the soft rot bacteria cannot therefore be satisfactorily effected by these criteria.

The isolates corresponding in morphological and physiological characters with *E. carotovora* varied greatly in their pathogenicity to potato. Organisms capable of causing seed-piece decay (a form of soft rot) were

secured from numerous sources, indicating that this type of infection is more liable to arise from contamination of the cut seed tubers than from diseased seed stock. *E. carotovora* was frequently detected in intimate contact with certain common insect occupants of rotting plant tissues, e.g., *Hylemyia* [*Phorbia*] *cilicrura*, *H.* [*P.*] *brassicae* (in the puparia of which it survived exposure to a severe northern Maine winter), and *Psila rosae*, while three Maine cultures were isolated from potato scab (*Actinomyces scabies*) lesions. Three other cultures of *E. carotovora* were isolated from the soil of the Charleston (South Carolina) truck crop area and four from that of a Maine potato field; one of the former gave rise to a non-chromogenic variant on potato slices and other media.

Certain plants yielding the blackleg pathogen manifested atypical symptoms, being very small (4 to 6 in. in height) with darkened, decayed stems, and developing early in the season when the cause of their condition may not be easily recognized. An apparently undescribed organism with long polar flagella was found to be the agent of a yellow or creamy rot of the seed pieces near Charleston. In Maine a similar yellow decay is caused by different organisms, while still other weakly parasitic bacteria appear to be responsible in the same State for a slow, white to brownish rot of potato seed pieces, as well as for rotting of common and Chinese cabbage, cauliflower, and turnip. Tubers affected by 'stem-end browning' and a discoloration of the vascular bundles yielded apparently related pathogenic bacteria.

Goss (R. W.) & Jensen (J. H.). **A survey of bacterial wilt and ring rot of Potatoes in Nebraska in the spring of 1939.**—*Plant Dis. Reptr*, xxiii, 17, pp. 288–290, 2 maps, 1939. [Mimeographed.]

In two surveys made in Nebraska in the early spring of 1939, 21 out of 215 stock lots of stored non-certified potatoes contained tubers infected by *Bacterium sepedonicum* [*R.A.M.*, xviii, p. 788], while out of 254 lots of Nebraska certified seed potatoes growing in a test plot six contained infected plants. In addition, five lots of seed tubers from other States were found infected. A map is given showing the distribution of the disease in the United States.

Murray (R. K. S.). **Report of the Botanist and Mycologist for 1938.**—*Rep. Rubb. Res. Bd, Ceylon, 1938*, pp. 29–50, 1939.

In this report [cf. *R.A.M.*, xvii, p. 770] it is stated that during February and March, 1938, the weather in most of the *Hevea* rubber-growing areas of Ceylon was exceptionally cool, dull, and wet; the maturation of the young leaves was delayed, and infection by *Oidium* [*heveae*: ibid., xviii, p. 816] became unusually severe. The control given by sulphur dusting was poor in most cases, as the dust was largely washed off the leaves, and the fungicidal efficiency of what remained was probably reduced by the absence of sun.

The apparent freedom of old rubber from root fungi (*Fomes lignosus*, *F. noxius*, and *Poria hypobrunnea*) [ibid., xviii, p. 655] is not evidence that the young plants will remain unaffected. For example, of two clearings in the same district, one may be entirely free from *F. lignosus* while the other is severely infected, though in both clearings the old

trees may have seemed healthy. In the uninfected clearing the preliminary removal of lateral roots would be uneconomic, whereas in the infected one any reasonable expenditure involved in the discovery and eradication of the infection centres would be justified. Replies to a questionnaire circulated among growers showed that the loss from root disease up to the end of 1937 was only 1,120, 74, and 51 trees killed by the three above-mentioned fungi, respectively, over 10,048 acres or about 0·1 per cent. There does not appear to be, therefore, any cause for serious apprehension. On 17 estates, however, representing 1,713 acres, there was a loss of 976 trees and one estate had over 498 cases of *F. lignosus* alone. Taking the average number of trees per acre as 120, the percentage loss was about 0·06 and 0·14 per cent., respectively, in certain areas where the lateral roots were and were not removed before replanting. The evidence showed that the affected plants generally occurred singly, that the source of infection was almost invariably an old rubber root, and that the practice of digging over infected areas and removing all roots in most cases gave effective control.

Helminthosporium heveae [loc. cit.] continued to give trouble in nurseries; in one test with several different fungicides only sulphur dust gave any appreciable control.

WAKSMAN (S. A.) & MARTIN (J. P.). **The role of micro-organisms in the conservation of the soil.**—*Science*, N.S., xc, 2335, pp. 304–305, 1939.

In studies carried out in New Jersey to determine the extent of soil binding and aggregation induced by micro-organisms, artificial soils consisting of sterile sand-bentonite and sand-clay mixtures were adjusted to optimum moisture and inoculated with pure cultures of fungi and bacteria or with a soil infusion. Sucrose or cellulose were used as sources of energy, and nutrient salt solutions were added. After incubation for various periods, the contents of the flasks were analysed to show relative differences in binding effects.

The results obtained showed that, using sucrose as the source of energy, and *Rhizopus nigricans*, *Aspergillus niger*, *Azotobacter indicum*, *Bacterium* [*Pseudomonas*] *fluorescens*, and soil infusion for inocula, the bound material amounted to 3, 25, 26, 10, and 17 per cent., respectively, compared with 0 for the control in tests using the pipette method, and 36, 72, 60, 36, 45, and 0 per cent. with the slope method. Using cellulose, the corresponding figures were 18, 14, 21, 41, and 0 per cent. (pipette), and 26, 21, 26, 45, and 0 per cent. (slope).

These figures demonstrate that soil organisms exert an important binding effect, the degree of which depends on the organism concerned. Similar results were obtained with sand-clay mixtures. It is concluded that micro-organisms play a very important part in soil conservation, which is closely associated with the transformation of the organic matter added to the soil.

RODIGHIN (M. N.). Редкие и малоизвестные грибные болезни Сафлора в Поволжье. [Rare and little known fungous diseases of Safflower in the Volga region.]—'25 years Saratoff Agricultural Institute', Saratoff, pp. 186–190, 1939.

In this annotated list of fungous diseases of safflower (*Carthamus*

tinctorius) in the Volga region of the U.S.S.R., descriptive notes are given of the following parasitic species: *Aecidium* [*Puccinia*] *carthami* [*R.A.M.*, vi, p. 355], reported for the first time from the Soviet Union; *Phyllosticta carthami* described in 1934 by A. Tropova [cf. *P. carthami* Roldan, 1936: ibid., xvi, p. 209]; *Ascochyta carthami* [ibid., vii, p. 764]; *Septoria carthami* [ibid., xviii, p. 413]; *Ramularia carthami* [ibid., vii, p. 165]; *Cercosporella carthami* [ibid., vi, p. 355]; and *Macrosporium carthami* Rodighin n.sp. The last-named produces on the leaves reddish-yellow, later brown, spots which become covered on both sides with a dark, velvety growth of fasciculate conidiophores, 80 to 124 by 4 μ, bearing [ob-]clavate or fusoid, olivaceous conidia, with 6 to 12 transverse septa, 58 to 74 by 11 to 14 μ. In addition two new saprophytic species are described, viz., *Phoma carthami* and *Stagonospora carthamicola* from dried stems. All new species have Latin diagnoses.

Bureau of Sugar Experiment Stations. Gumming disease in the Hambledon area. Official notifications. Quarantine areas.—*Aust. Sug. J.*, xxxi, 6, pp. 334, 351, 1939.

The Director of the Bureau of Sugar Experiment Stations, Queensland, reports the development of an outbreak of gumming disease [*Bacterium vasculorum*], chiefly affecting the S.J. 4 sugar-cane variety [*R.A.M.*, xviii, pp. 619, 625] in the Hambledon Mill area in July, 1939. The planting of the variety in question will therefore in future be prohibited over the major part of the area, and growers are further reminded that Clark's Seedling and Gaspari will also be disallowed in 1941. The outbreak having occurred some miles north of the nearest known centre of infection in the Mulgrave area, the pathogen was evidently introduced with a consignment of diseased plants and not by natural means.

Details are given of the nature and extent of the quarantines imposed in the Moreton Mill District, Mapleton, and Isis Mill District Quarantine Areas of Queensland in respect of Fiji disease of sugar-cane [ibid., xviii, p. 760].

Hutchinson (S. A.). **Macroconidial formation in Ophiostoma majus (van Beyma) Goidànich.**—*Ann. Bot., Lond.*, N.S., iii, 12, pp. 795–802, 1 pl., 1939.

A detailed account is given of the formation of macroconidia by *Ophiostoma majus* [*R.A.M.*, xiv, p. 703]. The macroconidia arise endogenously by free cell division within the terminal cell of the conidiophore. The outer wall at the tip of the conidiophore dissolves and the protoplast, enclosed in a delicate inner wall, is extruded. The extruded portion rounds off to form the spore, which becomes invested by a thick wall. The inner wall of the conidiophore remains as a delicate sheath round the spore chain until maturity is reached.

Emendations to the second edition of the List of Common Names of British Plant Diseases (prepared by a Sub-committee of the British Mycological Society's Plant Pathology Committee and approved by that Committee).—*Trans. Brit. mycol. Soc.*, xxiii, 3, pp. 273–280, 1939.

In this paper W. C. Moore, G. C. Ainsworth, E. W. Mason, and Miss

E. M. Wakefield set out certain necessary emendations to the second edition of the List of Common Names of British Plant Diseases [*R.A.M.*, xviii, p. 754].

The name *Bacillus* being no longer tenable for plant pathogens [ibid., xvi, p. 482; xviii, p. 658], *B. phytophthorus* (= *B. atrosepticus*) is changed to *Bacterium phytophthorum* or *Erwinia phytophthora*, *B. carotovorus* to *Bact. carotovorum* or *E. carotovora*, and *B. aroideae* to *Bact. aroideae* or *E. aroideae*. In conformity with Wollenweber and Reinking's 'Die Fusarien' (1935) [ibid., xiv, p. 708], *Fusarium avenaceum* supersedes *F. herbarum* var. *avenaceum*, *F. solani* var. *martii* is replaced by *F. solani* var. *martii* f. 3, *F. bulbigenum* by *F. bulbigenum* var. *lycopersici*, *F. lycopersici* Sacc. by *F. lycopersici* Brushi, and *F. lateritium* var. *fructigenum* by *F. lateritium*.

The original spelling '*levis*' in the name *Ustilago laevis* is retained. When the word means 'smooth' the usual botanical spelling is '*laevis*', to distinguish it from '*lĕvis*' (light in weight), and various writers have unjustifiably changed the original *U. levis* to *U. laevis*.

Puccinia lolii is discarded in place of *P. coronata* for the crown rust of oats, in view of the work of Miss Brown [ibid., xvii, p. 23].

For chocolate spot of beans, vetch, and sainfoin *Botrytis cinerea* is accepted as the pathogen in place of ? *Bacillus lathyri* in accordance with A. R. Wilson's findings [ibid., xvi, p. 722].

The authority for the name *Alternaria brassicae* is changed, according to Article 54 of the International Rules of Botanical Nomenclature [ibid., xvi, p. 482] from (Berk.) Bolle to (Berk.) Sacc. According to Bolle [ibid., iv, p. 60], Saccardo did not have Berkeley's species before him when he transferred *Macrosporium brassicae* Berk. to *Alternaria*, and Bolle therefore claimed to re-make the combination when she had what she thought was the correct species.

The authority for *Uromyces betae* is changed from (Pers.) Tul. to Lév. as Léveillé made the combination seven years before Tulasne, and Persoon's name only refers to the uredo stage and must not be cited.

The correct citation for *Rosellinia necatrix* is *R. necatrix* Prill., though *R. necatrix* Berl. in Prill. may be used.

In the case of aster wilt, *Fusarium* spp. is replaced by *F. conglutinans* var. *callistephi* [ibid., xviii, p. 336]. Ring spot of carnation and pink and leaf spot of sweet william are attributed to *Didymellina dianthi* since this ascigerous stage of *Heterosporium echinulatum* has now been found in Scotland [ibid., xvi, p. 255]. The whole entry for wilt and stem rot of carnation and pink is deleted and replaced by *Verticillium* wilt, *Fusarium* wilt, and stem rot which are given as *V. cinerescens*, *F. dianthi* and *F. culmorum*, and *Fusarium* spp., respectively [ibid., xv, p. 225]. The transference of *Diaporthe umbrina* to *Cryptosporella* as *C. umbrina* is recognized for the fungus causing brown canker of rose [ibid., xv, p. 155], and *Sclerotinia polyblastis* is accepted as the ascigerous stage of *Botrytis polyblastis* [see above p. 97], the cause of *Narcissus* fire. The spelling of *C*[*olletotrichum*] *linicolum* is changed to *C. linicola*.

Gibberella saubinetii is maintained for the well-known parasite of cereals, though Petch has claimed it as a synonym of *G. cyanogena* and maintains that the cereal fungus is really *G. zeae* (Schw.) Petch [ibid., xvi, p. 29], since 'for the time being it is considered desirable to retain

the widely used and familiar name'. *Urocystis* is used in preference to *Tuburcinia* pending the decision of the International Botanical Congress [ibid., xviii, p. 755]. *P. hordei* Otth (1871) is earlier than *P. hordei* Fuckel (1873) [ibid., xv, p. 209] and, if accepted, is the valid name for brown rust of barley. As, however, *P. hordei* is applied only to a yellow rust of barley, it has been decided not to use it, without consultation, as the accepted name for barley brown rust, but to regard it as a *nomen ambiguum*.

So far as is known, none of the 155 species compiled as *Cylindrosporium* in Saccardo's *Sylloge* is congeneric with *Gloeosporium concentricum* (Grev.) Berk. [ibid., xviii, p. 654], which is the type species of Greville's monotypic genus. In order to retain *C. concentricum* all the 155 species will require to be renamed and it is proposed, therefore, to continue the use of the name *G. concentricum* for the time being, but unless some action is taken to conserve the use of the name *Cylindrosporium* in a different sense from that of Greville, it will not be correct to do so indefinitely.

WAKEFIELD (E[LSIE] M.). **Nomina generica conservanda. Contributions from the Nomenclature Committee of the British Mycological Society. II.**—*Trans. Brit. mycol. Soc.*, xxiii, 3, pp. 281–292, 1939.

This further contribution [*R.A.M.*, xviii, p. 755] from the Nomenclature Committee of the British Mycological Society contains statements concerning thirteen more of the names proposed for conservation in the lists published as a supplement to the International Rules, 1935. The following genera, *inter alia*, are dealt with: *Peziza* Fr. (1822) versus *Aleuria* Fuckel (1869), *Coniothyrium* Sacc. (1880) versus *Clisosporium* Fr. (1832) and *Coniothyrium* Corda (1840), *Sphaeropsis* Sacc. (1880) versus *Sphaeropsis* Lév. (1842) and *Macroplodia* Westend. (1857), *Phoma* (Desm.) 1849 versus *Phoma* Fries (1823) and *Sphaeropsis* Lév. emend. O. Kuntze (1898), *Stagonospora* Sacc. (1884) versus *Hendersonia* Berk. (1841) and *Psilothecium* Fuckel (1865), *Hendersonia* Sacc. (1884) versus *Hendersonia* Berk. (1841) and *Sporocadus* Corda emend. O. Kuntze (1898), and *Marssonina* Magnus (1906) versus *Marssonia* Fischer (1874) non Karst. (1858) and *Marsonia* Sacc. (1880).

PEREIRA DE MELO (P. P.). **O 'saporema' de Pernambuco.** [The 'saporema' of Pernambuco.]—*Bol. Agric., Pernambuco,* iv, 2, pp. 127–129, 3 pl., 1939.

No indication of pathogenicity of the 'saporema' fungus, considered by B. Pickel to be an undescribed species of *Polyporus* which he terms *P. pseudosaporema* n.sp. [without a diagnosis], has so far been obtained in experimental plots of sugar-cane and cassava inoculated by interplanting with sclerotia of the fungus in Pernambuco, Brazil [*R.A.M.*, xvii, p. 191].

CHRISTOFF (A.). Корекции и бележки върху паразитната флора на България. [Revision and notes on the parasitic flora of Bulgaria.] —*J. agric. Exp. Stas Bulgaria,* ix, 2, pp. 77–85, 1939. [English summary.]

This list of parasitic diseases of plants in Bulgaria is supplementary

to that compiled by D. Atanasoff and D. Petroff in 1930 [*R.A.M.*, x, p. 210] and is based on hitherto unpublished records or unidentified herbarium material. The following may be mentioned among the 35 species recorded: *Phytomonas* [*Bacterium*] *holci* [ibid., xiv, p. 16; xviii, p. 517] on *Andropogon halepensis* [*Sorghum halepense*], *P. tabacae* [*Bact. tabacum*] on tobacco, *Septoria cannabis* on hemp [ibid., xvi, p. 749], *S. mahoniae* on barberry, *Rhynchosporium secalis* on two-rowed barley [ibid., xvii, pp. 233, 654], *Gymnosporangium juniperinum* [ibid., xvi, p. 562] on apple, *Ustilago ficuum* on fig, *Hendersonia conorum* on pine (*Pinus sylvestris*) needles, *Septoria ampelina* on the vine [ibid., xvii, p. 95], and *S. graminum* [ibid., xviii, p. 297] on wheat. In addition 48 species have been found to be wrongly determined and are corrected, the following rectifications being of interest: *Phytomonas* [*Bact.*] *mori* on *Morus* sp. has been incorrectly identified in the past as *Coniothyrium foedans*, *Uromyces appendiculatus* on beans (*Phaseolus vulgaris*) as *U. phaseolorum*, *U. fabae* on lentils [ibid., xvii, p. 220] as *U. viciae fabae* on broad beans, and *Septoria rubi* [ibid., xvii, p. 190] on raspberry as *Phyllosticta ruborum*.

Moesz (G.). **Fungi Hungariae. III. Ascomycetes. Pars 1.** [Fungi of Hungary. III. Ascomycetes. Part 1.]—*Ann. hist.-nat. Mus. hung.*, Pars. bot., xxxii, pp. 1–61, 1939. [Hungarian and German.]

This is a critically annotated list, supplemented by a bibliography of 62 titles, of 120 Ascomycetes, mostly Erysiphaceae (65 species), Exoascaceae (20), and Elaphomycetaceae (13), collected in Hungary [cf. *R.A.M.*, xvii, p. 139].

Imazeki (R.). **Observations on Japanese fungi. II.**—*Jap. J. Bot.*, xv, 7, pp. 440–449, 7 figs., 1939. [Japanese, with English summary.]

Descriptive notes are given on the following fungi found on dead tree trunks in Japan: *Polyporus squalens*, *P. guttulatus*, *P. montanus*, *Trametes subrosea* [*R.A.M.*, ix, p. 80; xiv, p. 795], *T. malicola*, and *T. flavescens*.

Hilborn (M. T.) & Steinmetz (F. H.). **1937 and 1938 additions and corrections to the list of causes of fungous and bacterial plant diseases in Maine.**—*Plant Dis. Reptr, Suppl.* 113, pp. 21–26, 1939. [Mimeographed.]

This supplementary list of plant diseases found in Maine [*R.A.M.*, xvii, p. 773] comprises 115 pathogens and 55 hosts.

Gäumann (E.). **Zur Kenntnis einiger Carex-Puccinien.** [A contribution to the knowledge of some species of *Puccinia* on *Carex*.]—*Zbl. Bakt.*, Abt. 2, c, 24–26, pp. 483–500, 5 graphs, 1939.

Descriptions are given [in German and Latin] of five new species of *Puccinia* collected in the teleutospore phase on *Carex* in Switzerland, including *P. ribesii-diversicoloris* on *C. diversicolor* and *P. mayoriana* on *C. digitata*, both belonging to the collective species *P. ribesii-caricis* (*P. pringsheimiana*) [*R.A.M.*, xiii, p. 173; xvii, p. 704] and forming their aecidial stages on gooseberry and *Ribes alpinum* leaves; and *P. leucanthemi-vernae* (collective species *P. aecidii leucanthemi*) on *C. verna* and

C. ericetorum, the aecidial stage of which develops on *Chrysanthemum leucanthemi-vernae*.

ZUNDEL (G. L.). **Studies on the Ustilaginales of the world.**—*Mycologia*, xxxi, 5, pp. 572–589, 3 figs., 1939.

Among the species given in this annotated list of smuts from various countries the following are worthy of mention. *Ustilago cynodontis*, *U. dregeana*, and *U. paraguariensis*, which have in the past been confused with each other, were studied on the basis of original collections and found to be distinct species, differing clearly in the size and appearance of their spores. All three were reported on *Cynodon dactylon*, but the author demonstrates that *U. dregeana* has been attributed to this host by mistake probably for *Eragrostis porosa*.

A new genus, *Xylosorium*, with the type species *X. piperii* on *Piper* spp., is reported from South Africa, and *Sphacelotheca papuae* n.sp. found on *Saccharum arundinacea* from British New Guinea. Lists are also given of six species from Colombia, thirteen from Minas Geraes, Brazil, and six (two new) from the Clinton collection of smuts from south-eastern Asia. English and Latin diagnoses are given of the new genus and new species.

ZUNDEL (G. L. I.). **Additions and corrections to Ustilaginales.**—*N. Amer. Flora*, vii, 14, pp. 971–1030, 1939.

This contribution to the North American Flora adds nearly 80 species [including 13 new species for which Latin diagnoses are given] and numerous host records to Clinton's account of the Ustilaginales of North America (*N. Amer. Flora*, vii, 1, pp. 1–82, 1906). Revised keys to the species of the larger genera are given in full.

BARNHART (J. H.). **Revised host-index to the Ustilaginales.**—*N. Amer. Flora*, vii, 14, pp. 1031–1045, 1939.

This host index combines the original one (*N. Amer. Flor.*, vii, 1, pp. 73–82, 1906) and the additions and corrections given in the preceding paper.

GADD (C. H.). **A virus disease of Tea.**—*Tea Quart.*, xii, 3, pp. 110–116, 2 figs., 1939.

In this address to tea planters in Ceylon, the author states that phloem necrosis [*R.A.M.*, xviii, p. 713], now regarded as due to a virus, has spread extensively through the tea-growing parts of the island. It has been observed on 51 estates, and the evidence suggests that every estate situated at an altitude of more than 4,000 ft. may be harbouring the disease to some extent. In some fields 50 per cent. of the bushes are affected. All unproductive bushes showing the backward curl of the leaves characteristic of the condition should be removed, the vacant sites again being planted to tea immediately, if desired.

In the discussions that followed (pp. 116–130) the author, in commenting on the increased yield obtained by one grower from a field of necrotic tea (viz., 1,547, 1,570, 1,634, and 1,866 lb. per acre, respectively, in three-yearly periods between 1926 and 1938), agreed that crop returns give small indication of the disease in its initial stages; in some instances,

even advanced stages may not lead to any marked drop in yield. On the other hand, he had observed one field in which a progressive and marked reduction in yield was definitely due to phloem necrosis. The removal of badly necrosed bushes in large numbers may at first have only a negligible effect on yield. The lowest elevation at which the disease has been found is 3,400 ft.; at the lower altitudes the symptoms become more difficult to recognize than at the higher elevations. The condition is most easily recognized in fields 'coming back' from pruning, about tipping time. It occurs most frequently in fields of the hybrid type, but certainly attacks bushes of good jât also. As high jât is distinguished from low jât mainly by leaf size, necrotic bushes necessarily appear lower in jât than they really are. Pruning cuts experimentally exposed to contact with juice from infected plants failed to develop infection. In conclusion, the author expressed his inability to recognize the earliest stages of infection, and stated that in one experiment twelve months elapsed before he could be certain that transmission had been effected.

PARK (M.) & FERNANDO (M.). **A convenient method of determining the incubation period of a plant pathogen in the field.**—*Trop. Agriculturist*, xciii, 4, pp. 213–214, 1 graph, 1939.

A technique developed in Ceylon in connexion with tobacco frog eye [*Cercospora nicotianae*: *R.A.M.*, xvii, p. 755] is described for estimating the incubation period of the pathogen in the field. In a tobacco crop approaching maturity large numbers of conidia are deposited on the leaves every day and new infections develop continuously. A curve of the number of lesions developing on such leaves plotted against time will accordingly exhibit an uninterrupted rise. When, however, leaves are sprayed with a fungicide, all conidia falling on the leaf after spraying will be killed, and the symptom curve will show a rise for a period not exceeding the incubation period of the fungus, after which it will abruptly flatten out. The interval between the date of spraying and this abrupt flattening of the curve will consequently provide an estimate of the incubation period. The fungicidal cover, however, is rarely completely effective, and occasional infections may arise even after spraying. The latter part of the curve, therefore, will not always be quite horizontal. Records of lesion numbers made during 1938–9 in Ganewatta showed the incubation period of *C. nicotianae* to last from five to eight days. The method is probably applicable to other diseases amenable to control by spraying.

OKUDA (Y.) & KATAI (K.). **Biochemistry of mosaic disease of Tobacco. III. Catalase in the leaves of healthy and mosaic plants. IV** (with T. HIBI). **Oxidase, peroxidase, and amylase in the leaves of healthy and mosaic plants. V. Ascorbic acid contents in the leaves of the healthy and mosaic plants.**—*J. agric. chem. Soc. Japan*, xiv, pp. 1264–1270, 1386–1394, 1938; xv, pp. 80–86, 1939. [Abs. in *Chem. Abstr.*, xxxiii, 21, p. 8690, 1939.]

The iodine method of determining the relative catalase contents of healthy and mosaic tobacco foliage [*R.A.M.*, xviii, p. 415] was found to be the most effective of those tested. Catalase activity in both leaf

groups reached an optimum at P_H 7 to 7·5 and 15° C. The catalase content was higher in the upper than in the lower leaves and in sound than in diseased foliage.

Peroxidase activity was most marked in the healthy lower and diseased middle leaves, and generally stronger in mosaic than in sound material. In stored leaves the peroxidase content rose slightly for four days and then gradually decreased. The optimum hydrogen-ion concentration and temperature for peroxidase activity were, respectively, P_H 6 to 6·5 and 60°. The action of oxidase was most powerful in the upper leaves and was, in general, stronger in mosaic than in healthy foliage. In storage the activity of oxidase attained a maximum after seven days and was most in evidence at P_H 7·3 and 60°. There was no difference between healthy and diseased leaves as regards the operation of amylase, the content of which was higher in the lower than in the upper foliage. The optimum hydrogen-ion concentration and temperature for amylase activity were, respectively, P_H 7 and 40°; glycerol exerted a retarding effect.

Using a new technique [which is described] for the estimation of ascorbic acid, it was found that this substance, especially in its reduced form, was richer in the upper than in the lower leaves. The ratio of reduced ascorbic acid to the total was 70 to 80 per cent. The ascorbic acid content of the sound foliage was slightly superior to that of the diseased leaves [cf. ibid., xvii, p. 266]. In stored leaves the reduced ascorbic acid fell to nil in a week, while the oxidized reached a maximum in five to six days.

MANDELSON (L. F.) & TOMMERUP (E. C.). **Yellow patch of Tobacco seedlings.**—*Qd agric. J.*, lii, 3, pp. 280–294, 4 figs., 1 graph, 1939.

During the past four or five seasons tobacco seedlings in North Queensland have been affected by a condition referred to as 'yellow patch' or 'yellowing'. Seed germination is impaired, and the number of seedlings that emerge is greatly reduced. In some patches the cotyledons remain small, and when the true leaves develop the seedlings are stunted, pale green or yellow, and generally die, whereas neighbouring plants show normal growth. The affected patches do not enlarge, but new patches may develop in a bed later. Severity decreases in time, and as the soil is moistened and worked and after two or three attempts to establish a seed-bed, a satisfactory stand may be obtained after re-sowing, provided no additional fertilizer is applied.

Preliminary investigations indicated that the trouble was physiological and closely associated with the application of excessive quantities of organic nitrogen in mixed fertilizers to the seed-bed. It is probably caused by the accumulation of free ammonia in the soil. In further experiments, even 0·1 oz. nitrogen as dried blood per sq. yd. retarded growth, and when quantities over ½ oz. were used nearly all the seedlings succumbed. The condition did not appear where only nitrate of soda in various amounts was used as the source of nitrogen, and the use is recommended of a fertilizer mixture consisting of two parts nitrate of soda, four parts superphosphate, and one part sulphate of potash (by weight), applied at the rate of 1¾ oz. per sq. yd. of seed-bed. No yellow patch appeared in seed-beds treated with this mixture in 1938–9.

Smith (T. E.). **Host range studies with Bacterium solanacearum.**—*J. agric. Res.*, lix, 6, pp. 429–440, 5 figs., 1939.

In experiments carried out from 1935 to 1938, inclusive, to compare the susceptibility of numerous plants to natural and artificial infection by *Bacterium solanacearum*, the hosts were grown for one or more seasons in highly infested soil, cultivation with horse-drawn and hand implements facilitating natural infection following root injury. Each season every third or fifth row was planted with highly susceptible tobacco varieties. Counts were made of plants showing symptoms on the below-ground as well as on the above-ground parts, and in addition numerous observations were made on infested farms. Tests on artificial infection were made by inserting wedges of discoloured tissue from the woody cylinder of affected tobacco plants into the stems of the different hosts just below the terminal buds.

Twenty-nine species reacted positively to both natural and artificial infection. Of these tobacco, tomato, *Nicotiana rustica*, eggplant, *Datura stramonium*, *Solanum nigrum*, *Croton glandulosus*, *Bidens bipinnata*, *Xanthium pennsylvanicum*, nasturtium, potato, and *Eclipta alba* showed 71 to 100 per cent. natural infection; chilli, *Physalis pruinosa*, and sunflower 51 to 70 per cent.; beans (*Phaseolus vulgaris*), *Ambrosia elatior*, *Aster pilosus*, *Dahlia rosea*, *Ricinus communis*, *Tagetes erecta*, and *Petunia hybrida* 21 to 50 per cent.; and groundnut, *Leptilon canadense*, *Ambrosia trifida*, *S. carolinense*, *X. chinense*, *Verbena hybrida*, and *Cosmos bipinnatus* 1 to 20 per cent. On the less susceptible species root rot rather than foliar wilting was generally the predominant symptom.

Species consistently susceptible to artificial inoculation but apparently unaffected through the roots by the soil-borne parasite were cowpea, soy-bean, *Stizolobium deeringianum*, Lima bean (*Phaseolus lunatus*), and *Canna* sp. Cowpeas, soy-beans, and *S. deeringianum* remained unaffected, even under very severe conditions of natural infection, and the number of bacteria present in the tissues after artificial inoculation was ascertained to be very greatly inferior to the number present in naturally infected tobacco, the organism being unable to multiply rapidly in these three hosts. Twenty species of cultivated, and 36 species of wild, plants [which are listed] were unaffected by artificial or natural infection and are considered to be immune; of these, five have been listed by various workers as susceptible.

It is concluded that the following should be removed from the host list of *Bact. solanacearum*: sweet potato, cotton, watermelon, fireweed (*Erechtites hieracifolia*), *Crotalaria striata*, *S. deeringianum*, *P. lunatus*, soy-bean, and cowpea, and that *X. pennsylvanicum*, *X. chinense*, *Physalis pruinosa*, *Aster pilosus*, and *Ambrosia trifida* should be added to it.

Valleau (W. D.), Diachun (S.), & Johnson (E. M.). **Injury to Tobacco leaves by water-soaking.**—*Phytopathology*, xxix, 10, pp. 884–890, 3 figs., 1939.

Observations on White Burley Kentucky No. 16 tobacco leaves subjected to artificial water-soaking by means of a specially devised spray nozzle apparatus connected by a pipe with a garden hose showed that

extensive injury is liable to result after periods of 24 to 72 hours, or within the next few days, quite independent of infection by *Bacterium tabacum* or *Bact. angulatum* [*R.A.M.*, xvii, p. 205]. The inoculation of water-soaked tissues with these organisms enhances the already existing injury but does not induce the typical field symptoms of wildfire. Water-soaking, therefore, is considered to play only a minor part, if any, in the development of wildfire epidemics on maturing dark tobacco in Kentucky.

Haddow (W. R.) & Adamson (M. A.). **Note on the occurrence of needle blight and late fall browning in Red Pine (Pinus resinosa Ait.).**—*Forest. Chron.*, xv, 2, pp. 107–110, 1 pl., 1939. [Abs. in *Biol. Abstr.*, xiii, 9, p. 1582, 1939.]

In several localities of Simcoe and Durham Counties, Ontario, young, densely planted red pine (*Pinus resinosa*) trees have been affected since 1932 by a summer blight and autumn browning of the current season's foliage. Both forms of the disease appear to originate in the oviposition of a gall midge (Cecidomyidae) at the needle bases. If the needles thus injured contract infection by *Pullularia pullulans* in the growing stage, blight develops; otherwise the midge larvae induce browning on reaching maturity in the autumn. Hitherto no trees have been killed by the disease.

Present status of the Dutch Elm disease.—*Plant Dis. Reptr*, xxiii, 17, pp. 286–288, 1 map, 1939. [Mimeographed.]

Between 1st January and 9th September, 1939, confirmations of the spread of Dutch elm disease (*Ceratostomella ulmi*) extended the main infected area round New York Harbour [cf. *R.A.M.*, xviii, p. 641] into five further counties, namely, two in Pennsylvania, and one each in Connecticut, New York, and New Jersey. The present distribution of the disease is indicated on a map accompanying the paper.

Goidànich (G.) & Azzaroli (F.). **Relazione sulle esperienze di selezione di Olmi resistenti alla grafiosi e di inoculazioni artificiali di 'Graphium ulmi' eseguite nel 1938.** [An account of experiments on the selection of Elms resistant to graphiosis and of artificial inoculations with *Graphium ulmi* carried out in 1938.]—*Boll. Staz. Pat. veg. Roma*, N.S., xix, 2, pp. 222–240, 4 figs., 1939.

In further inoculation experiments carried out in Italy in 1938 to determine the reaction of different elm selections to graphiosis [*Ceratostomella ulmi*: *R.A.M.*, xviii, pp. 213, 641] the resistance of *Ulmus pumila* was confirmed; of 52 inoculated trees of different ages and growing under different conditions not one died, the great majority remained perfectly healthy, and a few showed very slight symptoms. A strain of *U. campestris*, referred to as Villagrappa 3, also showed a high degree of resistance. *U. laevis*, which had previously shown resistance [ibid., xvii, p. 636], became heavily infected. Hybrids of *U. pumila* derived from crosses with *U. campestris* and *U. montana* showed marked resistance. Outstanding resistance was again shown by the C. Buisman elm [loc. cit.] grafted on *U. hollandica* or *U. pumila*. This variety is well suited for use as vine supports and appears to flourish under Italian

conditions. Evidence was obtained that to maintain the resistance of an elm used for grafting the grafts must be made on a resistant stock.

PEYRONEL (B.). **L'eterotallismo quale possibile causa della mancata o ritardata produzione della forma ascofora in talune Erisifaceae di origine esotica.** [Heterothallism as a possible cause of the absence or delayed production of the ascigerous stage in some Erysiphaceae of exotic origin.]—*Nuovo G. bot. ital.*, N.S., xlvi, 2, pp. 316–319, 1939.

Discussing the spread throughout Europe of *Uncinula necator* on the vine and *Microsphaera quercina* on the oak [*R.A.M.*, xix, p. 49], data on which are given, the author calls attention to the retarded appearance of the perithecial stages of these fungi. He puts forward the hypothesis that the species in question are heterothallic and that both + and − sexual types become diffused at different times across Europe or are introduced at successive periods from America, or that one spreads more rapidly than the other, owing perhaps to a more abundant production of conidia. When the mycelia of opposite sexes meet perithecia are formed, provided the condition of the host and the climatic factors permit.

GEORGESCU (C.) & BADEA (M.). **Uscarea puieților de Quercus rubra.** [The dying-off of Red Oak seedlings.]—*Rev. Pădurilor*, li, 9, pp. 717–719, 2 figs., 1939. [French summary.]

Red oak (*Quercus rubra*) seedlings in two stands near Bucharest have been dying off as a sequel to combined infection by *Aposphaeria allantella* (Sacc. & Roum.) [Sacc.] and a bacterium to be described in a future communication. The spheroidal pycnidia of the fungus measure 104 μ in height and 150 to 160 μ in diameter, and the hyaline, cylindrical spores 4 by 1 μ.

HERRICK (J. A.). **The growth of Stereum gausapatum Fries in relation to temperature and acidity.**—*Ohio J. Sci.*, xxxix, 5, pp. 254–258, 1939.

In this further study on *Stereum gausapatum* [*R.A.M.*, xviii, p. 718], a major cause of heart rot of oaks in the United States, it is stated that the fungus grew best in tests on potato dextrose and malt agars at a temperature of 25° C., while very little growth occurred at the two extremes of the experimental range, namely, 5° and 35°. The optimum P_H value for growth, using potato dextrose agar as the medium, was 4·6, but considerable growth took place from 2·8 to 7·6, though none occurred at 2·0 and 8·2. There was no indication of an isoelectric point.

CAMPBELL (W. A.) & DAVIDSON (R. W.). **Sterile conks of Polyporus glomeratus and associated cankers on Beech and Red Maple.**—*Mycologia*, xxxi, 5, pp. 606–611, 2 figs., 1939.

In 1938, sterile conks of a fungus identified from pure culture isolations as *Polyporus glomeratus* [*R.A.M.*, xviii, p. 487], with or without associated cankers, were common on beech in the Green Mountain National Forest, Vermont. The conks were obtuse-elongated or flattened, dark brown to black, roughened on the surface, and resembling those on birch due to *Poria* (?) *obliqua* [ibid., xix, p. 56], except for their smaller size (rarely protruding more than 3 in.). They frequently formed at old, unhealed branch stub openings and in time a definite canker

developed on the trunk above the stub. Sterile fungus material was deposited on the surface of the canker. On old trees the cankers were often as much as 2 ft. in length. *Polyporus glomeratus* rarely fruits on living trees but sporophores develop on fallen logs after several years. Sterile conks were also found on beech in New Hampshire and one each in Pennsylvania and Maine.

P. glomeratus was also associated with cankers on red maple (*Acer rubrum*) in New Hampshire and Vermont (less commonly in Connecticut and Pennsylvania), particularly in connexion with old branch stubs. Such cankers showed a hypertrophied margin and depressed centre, which was filled with a crust-like deposit of fungus material. Protruding sterile conks were rare, but occasionally a flattened, solid mass of fungus material was formed. The fungus was successfully isolated from the sterile conks and decayed wood. It is evidently an important agent of decay of red maple and has also been collected on sugar maple (*A. saccharum*) in Maine.

Hedgcock (G. G.). **Notes on the occurrence of Coleosporium in the south-eastern United States during 1938 and 1939.**—*Plant Dis. Reptr*, xxiii, 16, pp. 268–277, 1939. [Mimeographed.]

Data are given in tabular form on the occurrence and time of fruiting of species of *Coleosporium* found in Florida and other south-eastern regions of the United States in 1938 and 1939. In these localities, the pycnidia appear in December on the aecidial hosts represented by various species of *Pinus*. In Florida they become mature in January or February, preceding the aecidia by at least one month. The first aecidia to appear belong to *C. vernoniae* [*R.A.M.*, xviii, p. 424] and *C. apocynaceum*; these are followed a week or two later by those of *C. minutum*, and after two or three weeks by those of *C. elephantopodis* [ibid., xiii, p. 201] and *C. helianthae*, those of *C. ipomoeae* [ibid., vii, p. 538] and *C. laciniariae* [ibid., xiii, p. 201] appearing about a month later. Along the northern border in the eastern United States both pycnidia and aecidia appear at least two months later than in Florida. *C. solidaginis* [ibid., xvii, pp. 360, 602] produces no teleutosori in Florida, except possibly a few along the northern border, overwintering in the uredo stage. At higher altitudes and in cooler climates in the adjacent States north of Florida the teleutosori of *C. solidaginis* are often abundantly present.

Ehrlich (J). **A preliminary study of root diseases in western White Pine.**—*Sta. Pap. North. Rocky Mount. For. Range Exp. Sta., Missoula, Mont.* (*For. Serv. U.S. Dep. Agric.*), 1, 10 pp., 1 pl., 2 graphs, 1939. [Mimeographed.]

Of 52 isolates from root rots of western white pine (*Pinus monticola*) made in the summer of 1938 in the course of an intensive study of the incidence, importance, and identity of these diseases in four areas representing the 10- to 200-year age-groups in the Coeur d'Alene National Forest, Idaho, 31 were determined as *Armillaria mellea* [*R.A.M.*, viii, p. 682], 10 as *Fomes annosus* [ibid., x, p. 571], and 11 unspecified.

Of all the trees examined, 59 per cent. were infected at or near the

root-collar, the relative proportions of *A. mellea* and *F. annosus* being 85 and 13 per cent., respectively. Only in 16 per cent. of the trees, however, did the circumference of the collar killed amount to half or more, involving death in the near future. Analyses of cambial activity by five-year periods extending back for 25 years revealed no substantial reduction of increment in trees with less than 25 per cent. of the bared root surface infected. With 26 to 50 per cent. infection there was a significant fall in the extent of new growth, while over 50 per cent. was associated with a consistent reduction throughout the period covered.

Root rots were found to be more prevalent on poor than on fair or good sites and on short than on tall trees in the same age-group. Wet situations appeared to favour vigorous growth and consequent ability to resist infection. The degree of root infection was closely reflected in the colour of the foliage and to a somewhat lesser extent in crown density. Of the trees without ascertained root infection, 97 per cent. bore healthy green foliage and none showed any appreciable amount of brown leaves, whereas no healthy green was shown by the trees with more than half the root-collar circumference killed, and the foliage of the two trees in which the root-collars were completely destroyed was mostly brown. Of the apparently sound trees, 82 per cent. had dense to medium crowns and the rest open or ragged ones, while both those with the root-collars entirely killed showed ragged crowns; leaf colour thus furnished a moderately reliable measure of the extent of root infection, and crown density a less dependable gauge; neither feature affords an exact criterion of absolute infection. No evidence was obtained that root infection increases the likelihood of attack by the mountain pine beetle (*Dendroctonus monticolae*), but there was an indication that infection may take place and spread rapidly following beetle attack.

LEUTRITZ (J.). **Acceleration of toximetric tests of wood preservatives by the use of soil as a medium.**—*Phytopathology*, xxix, 10, pp. 901–903, 1939.

In the course of laboratory experiments at Summit, New Jersey, in which blocks of *Pinus echinata* sapwood were exposed to contact with termites (*Reticulitermes flavipes*) in rich garden soil, every specimen was found after two months to show extensive fungal decay. In order to test the possibility that any particularly virulent organism was responsible for the attack, untreated blocks of the same pine species were covered with soil of 20 per cent. moisture content placed in bottles, sterilized and inoculated with pure cultures of *Fomes roseus*, *Polyporus vaporarius* [*Poria vaporaria*], and *P. incrassata*, a comparative series being set up at the same time subject to the standard technique developed at the Bell Telephone Laboratories [*R.A.M.*, xvii, p. 785]. After 16 weeks the loss of weight due to *F. roseus* ranged from 30 to 34·7 by the new and 11 to 11·8 per cent. by the old method, the corresponding figures for *P. vaporaria* [ibid., xix, p. 55] being 37·8 to 41·8 and 10·9 to 12·7 and for *P. incrassata* 47·5 to 47·8 and 13·9 to 14·4, respectively. These data not only illustrate the high degree of uniformity and rapidity of invasion obtainable by the new method of testing, but also represent the maximum incidence of rot on untreated control specimens hitherto secured in the writer's studies on the protection of

wood against fungi of the dry rot type. Although the improved moisture control of the new technique may be the sole cause of the acceleration of rotting [ibid., xviii, p. 775], there is a possibility that this desirable effect results in part from the presence in the soil of organic or inorganic nutrilites.

FLACHS (K.) & WALTER (M.). **Studien über die Lebensbedingungen des Pilzes Monilia fimicola Cost. et Matt. und seine Beziehungen zum Champignon.** [Studies on the conditions of existence of the fungus *Monilia fimicola* Cost. & Matt. and its relations to the edible Mushroom.]—*Prakt. Bl. Pflanzenb.*, xvii, 3–4, pp. 98–114, 8 figs., 1939.

A severe epidemic of the 'white plaster mould' (*Monilia* [*Oospora*] *fimicola*) [*R.A.M.*, xviii, p. 88] of edible mushrooms [*Psalliota* spp.] in the Munich district of Germany in 1935–6 afforded an opportunity for a comprehensive investigation of the disease. The fungus was studied both in pure culture on a variety of media and in experimental mushroom beds. The optimum temperature for the growth of *O. fimicola* was about 18° to 20° [C.] and the optimum, maximum, and minimum hydrogen-ion concentration P_H 6·44 to 7, 4, and 8, respectively.

O. fimicola was found to act, not only as a true parasite, but also as a nitrogen-consumer, withdrawing sustenance from its host, to which it is, moreover, greatly superior in respect of adaptability to temperature and moisture conditions. The composition of the compost applied to the mushroom beds is of special significance both for host and pathogen, the former benefiting by an admixture of oats and wheat and the latter by that of sugar beets. In practice it has been found that the inclusion of beets in horse fodder exerts an adverse effect on the mushroom crop. A close connexion was also established between mushroom development and active nitrification of the soil.

Once the fungus has gained a foothold in the beds its elimination is impracticable, and preventive measures thus constitute the only hope of control. Foremost among these is the thorough cleansing of the cellars by sprinkling with a 2 per cent. formalin solution before the introduction of the spawn. The compost should be thoroughly heated, sufficiently rotted, and not too abruptly cooled off. The casing soil should be neutral or slightly acid, of a texture permitting the retention of moisture for a considerable period and enabling the mushroom mycelium rapidly to push its way upwards. Care must be taken to provide proper ventilation, while avoiding draughts and sudden fluctuations of temperature.

Modification of Dutch Elm disease quarantine regulations.—U.S.D.A., B.E.P.Q., 2 pp., 1939.

Amendment No. 4 (effective as from 11th September, 1939) to the rules and regulations supplemental to Notice of Quarantine No. 71 [*R.A.M.*, xiv, p. 480], relating to the embargo on the inter-State movement of elm material from specified areas in Connecticut, New York, and New Jersey on account of the elm disease [*Ceratostomella ulmi*], adds a number of new areas in the three States to those already regulated for this purpose, and records the appearance of the disease in two counties of Pennsylvania [see above, p. 124].

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TREVOR (J. S.). **The preservation of pit timber.**—*Colliery Engng*, xvi, 183, pp. 181–183, 2 figs., 1939.

The impregnation of British mine timber by creosote is commonly carried out by means of the open-tank process, but double the degree of permeation can be ensured by the use of reduced pressure, which requires, however, the installation of a more expensive plant. It was ascertained in 1935 by members of the Forest Products Research Laboratory that the average absorption of creosote by the open-tank method at the Pinxton Collieries, near Nottingham [*R.A.M.*, xv, p. 186], was 10·9 lb. per cu. ft. of props at a cost of 7·5*d.* per cu. ft. Of the 47 treated Norway pine props in use for five years, 40 were still sound, while 48 out of the 50 untreated controls were rejected. During the same period 33 out of 35 props were adequately preserved by impregnation with 2 per cent. zinc chloride at a cost of 2·1*d.* per cu. ft. Excellent results have also been obtained with Wolman salts [ibid., xvii, p. 2] (48 out of 49 props sound), treatment with which costs only 3½*d.* per cu. ft. at a strength of 2 per cent.

A promising new solvent preservative is copper naphthenate [ibid., xvi, p. 430], used as a 15 per cent. white spirit solution. It is a greenish, hard, resinous, sharp-smelling product formed by mixing copper sulphate with sodium naphthenate. Being entirely insoluble in water, it is particularly suitable for all timber liable to be placed in damp or waterlogged situations. When immersed in water for any length of time the copper naphthenate in the wood hydrolyses slowly, forming copper hydroxide and free naphthenic acid, both actively toxic to wood-destroying fungi. Other advantages of this compound, which is also effective in the preservation of the sisal fibres constituting the core of wire ropes, are its cleanliness and non-inflammability.

Other potentially interesting possibilities for future development, too expensive for present use, are briefly outlined. One is the partial impregnation of the wood with synthetic resins, followed by polymerization with a weak solution of mineral acid, while another, described in a recent patent, B.P.487,041, consists in double impregnation, first by alkali hydrate and then, after drying, with carbon disulphide to produce an impure viscose which forms an impermeable, fully protective coating. There is also the chlorinated diphenyl, known commercially as aroclors, which like the six other related compounds is waterproof, readily soluble in common organic solvents, resistant to inorganic acids and alkalis, as

well as to vaporization, and possesses other valuable properties conducive to absolute protection.

SMIETON (MARGARET J.). **On the use of chlorinated nitrobenzenes for the control of club root disease of Brassicae.**—*J. Pomol.*, xvii, 3, pp. 195–217, 1939.

In experiments on the control of club root of different species of *Brassica* (*Plasmodiophora brassicae*) [*R.A.M.*, xviii, p. 508] carried out over a period of four years at Slough, Bucks, commercial preparations of pentachlornitrobenzene and trichlornitrobenzene (referred to throughout this paper as substances A and B but obtainable under the trade names, folosan and brassisan [ibid., xvii, p. 471], respectively) were tested in comparison with mercuric chloride. The results obtained with white mustard grown on artificially contaminated soil in seed-boxes showed that the average percentages of clubbed seedlings in untreated soil and in that treated with A, B (each applied at the rate of 18 oz. per cu. yd. with lime as a filler), or mercuric chloride (0·1 per cent. solution, 2 gals. per sq. yd.) were 70, 38, 0, and 2, respectively. The results of four further experiments conducted on similar lines again demonstrated that B was superior to A, and that it equalled mercuric chloride in two out of three tests. The phytocidal effect of B was less marked when chalk was used as a filler, but better control of the disease resulted from the use of lime with both A and B.

The results obtained in outdoor seed-bed trials were rather irregular, but substance B, applied at the rate of 1½ to 3 oz. per sq. yd., gave a varying and sometimes considerable degree of control, though the larger dose tended to reduce the stand of seedlings.

Applied at the time of transplanting to dibble holes, small quantities of either A or B diluted with soil gave good control with increases in crop weight. When the standard method of dibble-hole treatment (one level dessert spoonful of a 1 : 5 volume mixture of fungicide and soil) was used in plots of Shaw's Nonpareil cabbage, substance B (lime filler) reduced infection from 20 very severely and 1 medium clubbed plants in the untreated to 0 and 21, respectively, the average weight of untreated and treated plants being 0·9 and 6·8 oz., respectively, while the corresponding figures in another test were 26 and 4, 0 and 3, and 4·5 and 7·3, respectively. In all outdoor trials mercuric chloride was again slightly more effective than the other two fungicides, but all three tended, in a variable degree, to check the growth of plants. Substance A is fungicidally inferior to B but is the least phytocidal of the three agents tested; in mild attacks it has given very good results.

PÁZLER (J.). **The spraying of Sugar Beets as a protection against Cercospora beticola Sacc.**—*Listy cukr.*, lvii, pp. 372–374, 1939. [Czech. Abs. in *Chem. Abstr.*, xxxiii, 22, p. 9525, 1939.]

During 1934, 1935, and 1938 a 1 per cent. cuprispora solution (consisting mainly of a copper soap) [*R.A.M.*, xviii, p. 721] was as effective as 1 per cent. Bordeaux mixture in the control of *Cercospora beticola* on sugar beets in Czechoslovakia [ibid., xv, p. 373]. In one experimental area in 1938 the green and root weights of treated beets were 333·9

and 458 quint. per hect., respectively, and the sugar yield and concentration 86·2 quint. and 18·83 per cent., respectively, the corresponding figures for the unsprayed controls being 168·6, 382·8, 62·3, and 16·27 per cent., respectively. Comparable results were obtained in other parts of the country. Late (August and September) treatments were still effective and beneficial. Importance is attached to the effect of the spray on the injurious amino nitrogen content of the plants, beets sprayed with cuprispora, 1 per cent. Bordeaux mixture, and untreated yielding 0·041, 0·042, and 0·055 per cent. amino nitrogen, respectively.

SCOTT (G. T.). **Progress in growing Sugar Beet seed.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 11, pp. 39–40, 1939.]

Six sugar beet varieties that have figured in the West Coast (California) Beet Seed Committee's planting operations during the past three years are characterized as follows in relation to curly top resistance [*R.A.M.*, xviii, p. 777]: U.S. No. 12 high, U.S. Nos. 14 and 15 moderate, Nos. 33 and 34 fair, and A-600 high. No. 14 is susceptible and 15 resistant to mildew [*Peronospora schachtii*: ibid., xviii, p. 150]. All the best varieties are fair to good yielders.

LEACH (L. D.). **Effect of downy mildew on Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 11, p. 40, 1939.]

Experiments in California in 1937 and 1938 showed that downy mildew [*Peronospora schachtii*: *R.A.M.*, xvii, p. 720 and preceding abstract] interferes with the normal production of sugar beets by reducing the average root weight, sucrose percentage, and purity, all these effects being more serious in the case of early than in that of late infections. In one of the two localities under observation the Hartmann and Eagle Hill appeared to be the most resistant and U.S. No. 14 the most susceptible [loc. cit.], while in the other R[abbethge] and G[iesecke] AA was the most resistant, followed by Hartmann, with U.S. No. 14 again the most susceptible.

LEACH (L. D.). **Results of Beet seed treatment, 1938.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 11, p. 39, 1939.]

Effective control of damping-off of sugar beets (*Pythium ultimum* [*R.A.M.*, xiv, p. 671], *Corticium solani* [ibid., xix, p. 1,] and other fungi) was found by experimental observations in 1938 in the Pacific Coast region of the United States to be practicable by means of seed treatment with ceresan [ibid., xvii, p. 153] at the rate of 1 to 1½ lb. per 100 lb., the improvement in the final condition of the stands being particularly noticeable in sparsely sown plantings. Definite symptoms of mercury injury were detected on the seedlings in one of the treated strips, and it was found that the presence of moisture and close confinement of the treated seed are the two most important factors in reducing the safety of the mercury treatment. Pending further observations on the operation of these factors in the warehouse, it is recommended that beet seed

should not be treated until a few days before planting, great care being taken to exclude moisture both before and after disinfection.

Campbell (L.). **Black root of Sugar Beets in the Puget Sound section of Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 379, pp. 5–14, 2 figs., 1939.

In this expanded, tabulated account of the writer's studies on the etiology and control of black root of sugar beets in the Puget Sound district of Washington [*R.A.M.*, xviii, p. 441] it is stated that *Rhizoctonia* [*Corticium*] *solani*, *Pythium de Baryanum*, *Aphanomyces cochlioides*, and *Fusarium* sp. associated with the disease are only saprophytic invaders, the true pathogen being *Phoma betae*. The bowing of the petioles described by Nuckols and Tompkins [ibid., viii, p. 542] is characteristic of the disease, the symptoms of which are given in detail. In control experiments none of the treatments tested was successful where the soil was heavily infected, but evidence was obtained that the use of 2 per cent. ceresan or new improved ceresan should be valuable against the pre-emergence stage where the incidence of black root lies between 25 and 50 per cent. Until a method of controlling the post-emergence stage of the disease is developed crop rotation combined with seed disinfection are recommended. Local seed has not been found to carry the fungus and its use is advocated.

Bertrand (G.). **Sur la maladie du cœur de la Betterave et son traitement par le bore.** [On the heart rot of Beetroot and its treatment by boron.]—*Sucr. belge*, lix, 1, pp. 3–8; 2, pp. 21–30, 1939.

This is a useful survey and critical discussion of some outstanding contributions to the understanding and control of heart rot of beet, the first authentic reference to which would appear to date from 1864 in France [*R.A.M.*, xvii, p. 643]. Much of the recent work on the treatment of the disease by means of soil amelioration with boron has been noticed from time to time in this *Review*. [This paper also appears in *Ann. agron.*, N.S., ix, 4–5, pp. 548–567, 1939.]

Price (W. C.). **Cross protection tests with two strains of Cucumber mosaic virus.**—*Phytopathology*, xxix, 10, pp. 903–905, 1 fig., 1939.

In order to ascertain whether the cucumber mosaic virus of Doolittle (*Phytopathology*, vi, pp. 145–147, 1916) and Porter's 'white pickle' virus [*R.A.M.*, xi, p. 349] should be classified in different groups, the former was inoculated at the Rockefeller Institute for Medical Research, Princeton, New Jersey, into young Golden Gem *Zinnia* [*elegans*] plants, in which it induced systemic mottling and marginal necrosis of some of the leaves. When the disease was thoroughly established, four to six leaves on each plant were rubbed with strain 6 of Porter's virus [ibid., xiv, p. 5], which was also inoculated into an equal number of healthy zinnias. In one of the tests 413 necrotic lesions developed in eight days on 22 previously sound leaves and one on the same number of mottled ones, the corresponding figures for another trial involving 56 leaves being 1,324 and none, respectively. This protective action of Doolittle's virus against strain 6 is considered to show its close relationship to Porter's 'white pickle', which exerts a similar

immunizing effect against strain 6. These two viruses, therefore, despite symptomatological and serological differences, should be placed in the same virus group [cucumber virus 1].

LEFEBVRE (C. L.) & WEIMER (J. L.). **Choanephora cucurbitarum attacking Cowpeas.**—*Phytopathology*, xxix, 10, pp. 898–901, 2 figs., 1939.

In 1937 and 1938 cowpeas at the Georgia Agricultural Experiment Station were attacked by *Choanephora cucurbitarum* [*R.A.M.*, xv, p. 632], the affected varieties being Groit (5 per cent. in the former year), Brown Sugar Crowder (one of the most susceptible), Etheridge, Crop Crowder, Jumbo Blackeye, Conch, Virginia Blackeye, Red Hulled Speckled, and California Blackeye. The fungus was most active on ripe or semi-mature densely shaded pods in damp, foggy weather, and was also commonly present on fallen flowers. In inoculation tests maturity was also a pre-requisite condition for a successful outcome, and the organism is therefore considered to be a weak parasite of cowpeas. Positive results were given by inoculations with *C. cucurbitarum* from cowpeas on Cymling and Summer, but not on Acorn squashes. Attention is called to the presence, not previously reported, of very fine longitudinal striations on the spore walls. The fungus also commonly occurs as a saprophyte on the leaves of grasses in Georgia and Florida.

MACDONALD (J. A.). **Plant diseases of St. Andrews district.**—*Trans. bot. Soc. Edinb.*, xxxii, 4, pp. 556–559, 1939.

In this annotated list of plant diseases found in the vicinity of St. Andrews during the past four years the author states that uredospores and teleutospores of *Puccinia pruni-spinosae* [*R.A.M.*, xviii, pp. 375, 745] were observed to be abundantly present on cultivated plum trees. This would seem to be the first Scottish record of these stages. *Coleosporium campanulae* [ibid., xvii, p. 797] was noted on cultivated *Campanula glomerata* and *C. persicifolia*. Arum lilies [*Zantedeschia aethiopica*] in three houses were attacked by *Phyllosticta richardiae* [ibid., xvi, p. 86], the yield of blooms in one house being reduced to one-fifth of the normal figure. Dark, waterlogged areas appeared on the petioles and leaves, and in severe cases all the leaf stalks were diseased. Young *Richardia* [*Zantedeschia*] plants were experimentally infected by atomizing them with a spore suspension of the fungus and retrocultures were successfully obtained.

Although always grown in the same house as chrysanthemums that became infected with powdery mildew (*Oidium* sp.) [*O. chrysanthemi*: ibid., xvii, p. 460], cinerarias [*Senecio cruentus*] showed no sign of such disease until late in 1938 [ibid., xviii, p. 459]; spore measurements indicated that the *Oidium* on chrysanthemum belonged to a different species from that found on cineraria.

MARCHAL (E.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1938.** [Observations and researches carried out at the State Phytopathological Station during the year 1938.]—*Bull. Inst. agron. Gembloux*, viii, 2, pp. 77–85, 1939. [Flemish, German, and English summaries.]

This report [cf. *R.A.M.*, xvii, p. 654] contains, among others, the

following items of phytopathological interest. Wheat in Belgium was commonly affected by eyespot lodging due to *Cercosporella herpotrichoides* [ibid., xviii, p. 448], but infection occurred only where unsatisfactory methods of cultivation had been practised. Pear branches were attacked, probably as a result of frost injury, by *Dermatea [Myxosporium] corticola* [ibid., xvii, p. 586], other pears being also infected by *Gymnosporangium sabinae* [ibid., xviii, p. 413] and *Mycosphaerella sentina* [ibid., xvi, p. 191, xviii, p. 820]. Raspberries were attacked by *Didymella applanata*, a fungus not recorded hitherto from Belgium. *Bacterium* [*Pseudomonas*] *syringae* [ibid., xviii, p. 154] occurred on lilac, and wilt of *Clematis* sp. was caused by *Verticillium albo-atrum*. A species of *Dracaena* was very severely infected by *Phyllosticta dracaenae*, and *Colletotrichum omnivorum* was on several occasions observed on *Aspidistra*.

Padwick (G. W.). **India and Burma: new plant diseases recorded in 1938.**—*Int. Bull. Pl. Prot.*, xiii, 11, pp. 256–258, 1939.

This list of plant diseases newly recorded in India and Burma during 1938 includes, in addition to items already noticed from other sources, *Fomes melanoporus* causing laminated heartwood rot of *Shorea robusta* and *F. lamaensis* causing honeycombed rot of sapwood and heartwood of the same host, both in the United Provinces.

Dey (P. K.). **Plant pathology.**—*Rep. Dep. Agric. Agra Oudh, 1937–8*, pp. 55–58, 1939.

Among the items in this report may be mentioned the Government sanction for the expenditure of a sum of Rs. 14,450 [£1,053. 15*s*.] for the importation from Scotland of 1,000 maunds [1 maund = 82·284 lb.] of Dunbar Cavalier and Majestic potato seed to be multiplied in the hills and eventually supplied to the plains of the United Provinces with a view to arresting deterioration from virus diseases.

A satisfactory new paste for the treatment of pruned surfaces on apple trees consists of red lead, copper carbonate, and linseed oil.

Report of the Agricultural Department, Dominica, 1938.—25 pp., Imp. Coll. Trop. Agric., Trinidad, 1939.

The following items of phytopathological interest occur in this report. Panama disease of bananas (*Fusarium* [*oxysporum*] *cubense*) [*R.A.M.*, xvii, p. 730] was found in 1·61 per cent. of the 37,165 stools inspected during the year. Banana leaf spot (*Cercospora musae*) [loc. cit.] is spreading on the one plantation where it was found in February, 1938, in spite of all attempts at control. Withertip of limes (*Gloeosporium limetticolum*) [ibid., xviii, p. 672] was exceptionally severe during the wet season, but the crop is now almost entirely produced by budded trees and the exports increased from the equivalent of 36,422 barrels in the previous year to 58,982 barrels.

Reichert (I.). **Palestine: diseases of vegetable crops.**—*Int. Bull. Pl. Prot.*, xiii, 10, pp. 225–240, 1939.

This is a list, in the compilation of which the author was assisted by M. Chorin, G. Minz, J. Perlberger, and F. Littauer, of the fungal,

bacterial, non-parasitic, and undetermined diseases of Palestine vegetable crops. New records, if any, are not specified.

McCormack (R. B.). **Secção de Fitopatologia.** [Section of Phytopathology.] *ex* **O Instituto de Pesquizas Agronomicos de Pernambuco.** [The Institute of Agricultural Research of Pernambuco.]—*Rodriguésia*, iv, 12, pp. 30–34, 1939.

Among the phytopathological problems occupying the attention of members of the Pernambuco (Brazil) Institute of Agricultural Research (stated in a foreword by A. B. Fagundes to have been founded on 7th September, 1935) are the following. Heavy losses are caused by boll rots of cotton, associated with species of *Aspergillus*, *Penicillium*, *Nematospora*, a pink *Fusarium*, yeasts, and in some cases with bacteria entering through the perforations made by insects, chiefly *Platyedra gossypiella*. Injuries of this type are specially prevalent under humid conditions. Most boll rots are initiated by insect infestation, an exception being that due to *Rhizopus nigricans*. Leaf rust (*Cerotelium desmium*) [*R.A.M.*, xviii, p. 575] occurs in a destructive form in parts of the State, inducing premature defoliation and thereby lowering the output of the crop. Areolate mildew (*Ramularia areola*) [*Cercosporella gossypii*: loc. cit.] is widespread but unimportant. Red leaf, a physiological disturbance [ibid., xvi, p. 97], is troublesome on soils deficient in potash. Young stands are liable to decimation by sore shin or damping-off (*Corticium vagum*) [*C. solani*], while a *Rhizoctonia* is responsible for a root rot of cotton and beans [*Phaseolus vulgaris*]. *F. vasinfectum* [f. 1] was isolated from two wilted plants in an experimental plot in November, 1936 [ibid., xvii, p. 35], since when the disease has spread to a considerable extent. Although the percentage of transmission by means of the seed is low (2 to 4), this channel is of great importance in the introduction of infection into hitherto healthy sites. Preliminary experiments in the sterilization of the seed with sulphuric acid have given promising results.

In some parts of the Recife district the tomato crops have been completely destroyed by *Bacterium solanacearum*, while blossom-end rot was severe in Dois Irmãos during the period under review [ibid., xviii, p. 637].

Other diseases under investigation include bean anthracnose (*Colletotrichum lindemuthianum*) [ibid., xiv, p. 734], *C. gloeosporioides* on mango [ibid., xvii, p. 539] and avocado [ibid., xvii, p. 612], and the algal rot (*Cephaleuros mycoidea*) of the foliage of mango, avocado, bread fruit [*Artocarpus integrifolia*], citrus [ibid., xvii, p. 596], and other fruit trees.

Ehrke (G.). **Fortlaufend arbeitender Kurznassbeizapparat mit Umlaufwaage der Fa. Gebr. Röber G.m.b.H., Wutha (Thür.) (Einzelprüfung).** [A continuously working short liquid disinfection apparatus with a rotatory balance from the firm of Röber Bros., Ltd., Wutha (Thuringia). (First trial).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), iv, 5, pp. 35–36, 1 fig., 1939.

Particulars are given of the construction and use of the Röber short

liquid steeping apparatus, which, like the dusting machine supplied by the same firm [*R.A.M.*, xviii, p. 604], is fitted with a special contrivance for regulating the automatic distribution of the fungicide. The equipment treats 800 kg. of seed-grain per hour and the average values for utilization of the fungicide in four lots of rye and oats were 96·65 and 95·5 per cent., respectively.

EHRKE (G.). **Selbsttätig arbeitender kombinierter Kurznass- und Trockenbeizer 'Poppelsdorf' Bauart Dipl.-Ing. Ott, der Maschinenfabrik F. Neuhaus G.m.b.H., Eberswalde. (Einzelprüfung).** [An automatically working combined short liquid and dry disinfection apparatus of Dipl.-Ing. Ott's construction, from the machine factory of F. Neuhaus, Ltd., Eberswalde. (First trial).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), iv, 10, pp. 75–76, 1 fig., 1939.

In collaboration with S. Reeh, K. Ebertz, and A. Winkelmann, the writer tested the 'Poppelsdorf' combined short liquid and dry seed-grain-disinfecting equipment, representing a constructional development and improvement in comparison with the original apparatus, 'Neusaat-Automatic', applicable with the former method only [*R.A.M.*, xviii, p. 466]. Applying the dust at rates of 200, 300, and 400 gm. per 100 kg., respectively, to rye and two lots of oats, the values obtained were 93·1, 95·4, and 96·3 per cent., respectively, of the possible maximum.

RIEHM (E.). **Establishment of an international collection of cereal varieties for the study of the physiological races of rusts.**—*Int. Bull. Pl. Prot.*, xiii, 11, pp. 259–261, 1939.

The author points out that plant breeders require to know the reaction of cereal varieties to rusts (*Puccinia* spp.) not only in their own countries but also in neighbouring ones, where different physiologic races of the rusts may exist. Such information may safely be obtained only by field experiments in the countries concerned and proposals are put forward for international collaboration in such a project.

PARKER-RHODES (A. F. T.). **Humoral immunity among plants.**—*Nature, Lond.*, cxliv, 3656, pp. 907–908, 4 graphs, 1939.

Leaves of wheat seedlings were inoculated with *Puccinia graminis tritici* and *P. rubigo-vera triticina* [*P. triticina*] and two or three days later severed from the plant, the rust being destroyed by placing the leaves in a water bath at 40° C. for 15 minutes. They were then inoculated again with the same or the other fungus, and the course of decay (comprising flecking, chlorosis, sporulation, withering, and the like) was recorded (according to an arbitrary scale) for up to ten days. The results are graphed and compared with calculated curves obtained by adding the data from two single inoculation controls. It was found that whereas the curves for the leaves inoculated with and cured of one rust and reinoculated with the other were almost identical in form and magnitude with those calculated for the controls, the curves for the leaves reinoculated with the same rust were retarded and enhanced as compared with the calculated curves, and did not bend sigmoidally,

as did the others, within eight days of the treatment. This would appear to indicate that while no appreciable interaction occurred between the two inoculations with different fungi, the two like inoculations did so interact. As the rust of the first inoculation was in every instance destroyed, the interaction was probably due to the production of some specific humour by the rust inoculated first.

Waldron (L. R.) & Harris (R. H.). **New varieties of rust resistant Wheat.**—*Bi-m. Bull. N. Dak. agric. Exp. Sta.*, i, 3, pp. 35–37, 1939; *Northw. Miller*, cxcviii, 7, p. 4, 1939. [Abs. in *Plant Breed. Abstr.*, x, 1, pp. 26–27, 1940.]

Of the four new wheat varieties described, namely, Rival, Vesta, Mercury, and Pilot, the three first-named were developed in North Dakota from a cross of Ceres × (Hope × Florence) and the last bred by J. A. Clark from a Hope × Ceres cross. Rival and Pilot were ready for general release in 1939, while the other two required further testing. Rival is slightly more susceptible to stem rust [*Puccinia graminis*] and less so to leaf [brown] rust [*P. triticina*] than Thatcher [*R.A.M.*, xix, p. 10].

Naoumoff (N. A.). Ржавчина хлебных злаков в СССР. [Rusts of cereals in the U.S.S.R.].—403 pp., 38 figs., 8 diags., 16 graphs, Moscow-Leningrad, Selkhozgiz, 1939. Roub. 18·50.

This monograph of cereal rusts is based on both Russian and foreign studies and represents a world survey of the present state of knowledge on the problem. The book, to which a bibliography of almost 2,000 titles is added, deals exhaustively with the cyclic development of rusts, the losses caused by them and methods of assessment, the influence of environmental conditions on rust incidence, physiologic races, varietal resistance and plant breeding, means of control, and methods of rust research in the field and the laboratory.

Rust of cereal crops.—286 pp., 7 figs., 5 graphs, 13 maps. Госуд. Издат. колх-совх. Литер. „Сельхозгиз" [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Moscow, 1938. [Received December, 1939.] Roub. 11.

This is a collection of papers on subjects dealt with at the First Pan-Soviet Conference on the Control of Cereal Rusts, held in 1937.

K. E. Mourashkinsky (pp. 94–101) summarizes the results of investigations on the cereal rust situation in West Siberia, carried out by various workers since 1925, as follows. On wheat *Puccinia triticina* and *P. graminis* were ubiquitous, the former being the more severe, while *P. glumarum* was considerably less frequent; on rye *P. dispersa* [*P. secalina*] and *P. graminis* were widespread, the former usually being the more virulent, while *P. glumarum* occurred rarely; on barley the most destructive rust was *P. graminis*, but *P. simplex* [*P. anomala*] and *P. triticina* were both present, the former being very common, while *P. glumarum* was ubiquitous on this host, but did not cause heavy losses; the species *P. hordeina* [*R.A.M.*, xii, p. 307] is believed to be identical with *P. triticina*; on oats *P. coronifera* [*P. coronata*] and *P. graminis* were almost equally serious. The alternate hosts, with the

exception of *Rhamnus cathartica*, are stated to play only a small part under West Siberian conditions, the chief sources of infection of spring cereals being the winter-sown wheat and rye, and possibly the uredospores overwintering on self-sown plants.

V. A. Zolotnitzky (pp. 149–159) states that black and brown rusts [*P. graminis* and *P. triticina*] are responsible for considerable losses of wheat in the Amur region [Far East], where the wheat varieties grown at present are said to be fairly resistant to rusts, but poor yielders, while most of the introduced ones prove susceptible under the particularly humid conditions which prevail. Several promising hybrids have, however, been obtained from crosses between the resistant and the productive varieties.

G. S. Galleeff (pp. 160–162) found that the yield of oats in the Voronezh district was reduced in 1933 from between 550 to 1,000 kg. per hect. to 400 by the attacks of rust [*P. coronata*]. In breeding experiments conducted from 1925 to 1936 the promising hybrids 17/30 and 15/37 were selected from among the 300 lines propagated from the F_3 generation of the cross between Red Rustproof 2869 and White Tartar 2174, and proved to be immune from *P. coronata.*

Mme T. I. Fedotova (pp. 163–169) applied the serological method to the determination of varietal resistance of wheat to physiologic races of *P. triticina*. The data showed that the globulins of different varieties do not react identically with serum prepared against the same race, and the globulins of one variety react differently with sera prepared against different races, indicating a varying degree of susceptibility of wheat varieties to different races of the rust. A comparison of the results obtained by the serological method with those from experimental infection of seedlings or field trials showed almost complete agreement in 16 out of 18 wheat varieties.

A. S. Barmenkoff (pp. 180–197) states that physiologic races 20 and 65 of *P. triticina* of different ecological and geographical origin proved to be heterogenous and points out that they are not accurately distinguished by the eight standard differential varieties of wheat. The author proposes the following additional varieties: Apulicum 77/2, Moskovskaya 02453, Melanopus 037, and Gordeiforme 010 for the differentiation of race 20 and Apulicum 77/2, Erythrospermum 020/430, Kanred × Fulcaster 266321, Argentine H31, and Fulcaster for that of race 65.

Mme M. N. Egorova (pp. 198–203) determined the presence of races 65, 20, 9, 17, and 66 of *P. triticina* in 54 collections made in the districts of Krasnodar and Ordzhonikidze [south-eastern Russia] from different varieties of wheat. The races occurred in the above-mentioned order of frequency. Evidence was obtained that race 65 is not homogeneous under different ecological conditions.

K. T. Sukhorukoff (pp. 204–209) discusses the physiological basis of the immunity of cereals from rust. Leaves of oats and wheat affected by crown and brown rusts [*P. coronata* and *P. triticina*, respectively] contain higher amounts of urea and ammonia than healthy ones and the permeability of their cells is increased by the presence of these substances and toxins. In strong sunlight photosynthesis is reduced in rusted oats, loss of water is strikingly increased, and consequently the activity of assimilating organs lowered, but in weaker light the photo-

synthesis of the rusted plants is higher than that of healthy ones. The most harmful effect of the rust on the host is believed to be the increased loss of water. The rust is stated to be generally susceptible to its own toxins.

A. Y. Kokin (pp. 210–211) found in the course of comparative inoculation experiments on Brevit wheat that the type of infection produced by race 17 of *P. triticina* became less intensive with the increasing age of the plants, while that caused either by 20 or 65 was not modified by this factor. Plants infected by race 17 had a higher enzyme activity and transpiration rate than those infected by either of the other two. The absolute weight of 1,000 seeds from plants infected by races 17, 20, and 65 was, respectively, 12, 20, and 14·9 per cent. lower than that of the healthy control; the average number of seeds in one ear was 5, 2·6, and 2·5, respectively, as compared with 7 in the control.

Chester (K. S.) & Jamison (C.). **Physiologic races of Wheat leaf rust involved in the 1938 epiphytotic.**—*Phytopathology*, xxix, 11, pp. 962–967, 1939.

Analyses of 98 wheat leaf rust (*Puccinia triticina*) collections made in Oklahoma in 1938 disclosed races 13, 19, 77, and 9 (in decreasing order of prevalence) [*R.A.M.*, xviii, p. 731] as the principal sources of the exceptionally severe outbreak of the disease in the State in that year [ibid., xviii, p. 663]. Other races of minor importance were 20, 5, 18, 2, 52, 54, 12, 28, 31, 33, 43, 58, and 68. Judged by their effects on the standard assortment of eight varieties (Malakoff, Carina, Brevit, Webster, Loro, Mediterranean, Hussar, and Democrat), races 13, 19, and 9 [ibid., xii, p. 151] are all variants of the same race, the slight differences in the reactions of the sensitive Carina and Hussar being attributed to environmental factors in the greenhouse. Similar considerations apply to races 5 and 15. Race 77 induced in all the differential varieties symptoms of severe (type 4) infection and is regarded as potentially troublesome, being the most virulent of all the 109 races hitherto described and able to withstand sharp freezing. On the other hand, its relatively lengthy incubation period (one to two days longer than that of 13) may restrict its distribution in the field.

Of the 50 wheat varieties of superior germ plasm tested for their reactions to individual and collective inoculation by the races 13, 19, 9, 77, 5, and 2, the two showing the highest degree of resistance were Kawvale × Marquillo and Hope × Hussar. Of 75 species of wild grasses inoculated with *P. triticina*, only one, *Agropyron trichophorum*, contracted infection and produced uredospores, which were, however, incapable of attacking wheat.

Hart (Helen) & Allison (L. J.). **Toluene compounds to control plant disease.**—*Phytopathology*, xxix, 11, pp. 978–981, 1939.

A tabulated account is given of the writers' experiments at the Minnesota University Farm in the control of wheat stem rust (*Puccinia graminis*, race 56) by means of the following chemicals: borax (sodium borate) 0·64 gm. per sq. m. soil surface [*R.A.M.*, xv, p. 350], picric

acid (12 gm.), paratoluenesulphonylamide (1 gm.), and orthotoluenesulphonylamide (0·8 gm.) [ibid., xvii, p. 663]. The two last-named gave the most promising results, the incidence of infection in the susceptible Marquis being only 4 rusted plants out of 21 for ortho- and 8 out of 44 for paratoluenesulphonylamide, while the corresponding figures for Ceres (susceptible) were 4 out of 19 and 8 out of 37, respectively, and for Mindum (resistant) 0 out of 20 and 6 out of 42, respectively. The sole injury arising from the use of these compounds was a slight, definite but transient tip burning of the basal leaves. Picric acid caused moderate and borax severe foliar scorching, the incidence of rust for the former being as follows: Marquis 29 out of 38, Ceres 28 out of 40, and Mindum 10 out of 41, and for the latter 7 out of 20, 9 out of 22, and 0 out of 22, respectively, while the figures for the three untreated controls were 58 out of 63, 58 out of 64, and 58 out of 62, respectively. These data are considered to justify further experimentation with the two toluene compounds.

Hart (Helen) & Becker (Hanna). **Beiträge zur Frage des Zwischenwirtes für Puccinia glumarum.** [Contributions to the question of an alternate host for *Puccinia glumarum.*]—*Z. PflKrankh.*, xlix, 10–11, pp. 559–566, 1939.

Although an alternate host for the aecidial stage of yellow rust of cereals (*Puccinia glumarum*) is not essential for the perpetuation of infection in the Harz Mountains, Germany [*R.A.M.*, xix, p. 77], the constant appearance of new physiologic races is considered to point very strongly to the interposition of a sexual phase. Negative results, however, have so far been obtained in a search for such a stage.

Lange-De La Camp (Maria). **Ernährungsversuche mit Haplonten von Tilletia tritici.** [Nutrition experiments with haplonts of *Tilletia tritici.*]—*Kühn-Arch.*, xlviii, pp. 179–190, 2 pl., 1939.

Following up the analytical studies of Becker [*R.A.M.*, xv, p. 637], Holten [ibid., xvii, p. 804], Fittschen [ibid., xviii, p. 514], and others on the genetic basis of 'aggressiveness' in wheat bunt (*Tilletia tritici*) [*T. caries*], the author carried out a series of cultural experiments to determine the response of haploid lines from ten different spore collections to the incorporation with the medium (potato decoction with and without agar) of varying amounts of sugar candy and malt extracts, peptone, carbohydrates, and different sources of nitrogen.

Under the influence of peptone the development of the mycelium on the solid medium in all the lines was stimulated to great luxuriance, forming compact masses, often over 1 cm. in height, with a flat peripheral zone which disappeared at a concentration of 40 gm. per l. At the same time the colour of the colonies gradually changed from brown to white with increasing doses of peptone, the optimum concentration of which for the growth of all lines was 10 to 20 gm. per l. The absence of peptone was not counterbalanced by augmenting the dose of sugar candy extract. Sporidia were formed in profusion in liquid cultures on tap water plus 5 gm. peptone and 40 gm. sugar candy, or on potato decoction with or without the peptone and sugar candy. Malt extract, tested as a substitute for sugar candy, gave the best results at a con-

centration of 12·5 gm. per l. plus 5 gm. peptone. Of the sugars tested, only dextrose and saccharose [lactose according to the table on p. 186] were utilized by the fungus, the latter to a much more considerable extent than the former. Very poor growth was made in the presence of inorganic sources of nitrogen, while of the organic substances used with sugar candy in the experiments asparagin (2 gm.) was the strongest stimulant to sporidial growth, followed by nucleic acid and peptone, whereas allantoin was useless for the purpose in view.

WHITE (N. H.). **The sexuality of Ophiobolus graminis Sacc.**—*J. Coun. sci. industr. Res. Aust.*, xii, 3, pp. 209–212, 1939.

Eight spores from each of three asci of *Ophiobolus graminis*, isolated from wheat in New South Wales [*R.A.M.*, xvii, p. 805], were cultured separately on potato dextrose agar. Each of these isolates gave rise to mature perithecia on transference to the roots of wheat plants grown in pure culture on nutrient agar, indicating that the fungus is homothallic [cf. ibid., v, p. 732].

LUNDBLAD (K.). **Gulspetssjukan på Gisselås försöksgård. Resultat av en serie fältförsök åren 1928–1936.** [Yellow tip disease at the Gisselås experimental farm. Results of a series of field experiments 1928 to 1936.]—*Medd. svenska Vall-o. MosskFören.* 2, pp. 71–127, 1939. [German summary.]

A fully detailed, tabulated account is given of studies and experiments in progress since 1928 on the etiology and control of reclamation disease of cereals [*R.A.M.*, xviii, p. 613] and meadow grasses, including timothy (*Phleum pratense*), *Agrostis stolonifera*, and *Poa pratensis*, at Gisselås, Jämtland, northern Sweden, where the trouble was first observed about 15 years ago, shortly after the initial breaking-up of the ground for cultivation. It soon became apparent that the plants were unable to utilize the large quantities of nitrogen present in the peat soil, and attempts were made to overcome this difficulty by burning straw and by the application of nitrogenous fertilizers. These methods were to some extent successful and resulted in increased yields, but the disease persisted, a noticeable improvement being effected only by manuring with a mixture of ammonium sulphate and copper sulphate (200 and 100 kg. per hect., respectively) in addition to the standard 200 kg. superphosphate and 150 kg. potash, though a slight benefit was also derived from treatment with manganese sulphate (100 kg.). In 1936 the yield of the highly susceptible Svalöf's Vega oats was practically trebled by the incorporation of copper sulphate with the soil, all symptoms of the disease being simultaneously eliminated. Further trials are necessary to determine the best practical methods for the combined cure of reclamation disease and facilitation of nitrogen utilization under local conditions.

VIGLIANO (I. C.). **El 'fermentado' del Maiz, sus clases y sus causas.** [Maize 'fermentation', its types and its causes.]—*An. Soc. rur. argent.*, lxxiii, 8, pp. 703–704, 707–708, 3 figs., 1939.

Diplodia zeae is the agent of two types of maize rot or 'fermentation'

in the Argentine, one affecting the growing plant and the other the stored product. Popular descriptions are given of the symptoms induced by mild, moderately severe, and heavy attacks of the organism, the two latter entailing reductions in the seed weight from 35 gm. per 100 healthy seeds to 30 and 14 gm., respectively. In regions where *D. zeae* is prevalent infection of the threshed grain averages 2 to 3 per cent. of rotted seeds, but the fungus is estimated to cause a total loss of about 20 per cent. of the stand in diseased areas. Serious damage is further apt to occur in lightly infected maize stored under humid and otherwise unsuitable conditions, which may thus serve to perpetuate the rot. Although seed treatment and other cultural measures are highly desirable as aids in the control of *D. zeae*, a radical improvement in the situation can only be effected by genetic studies directed towards the development of resistant strains within the valuable indigenous varieties available for breeding.

GOODING (J. H.). **Effectiveness of ethyl mercury phosphate seed treatment results from two separate and distinct kinds of action.**—*Agric. News Lett.*, vii, 10, pp. 81–83, 1939.

In an address made at a meeting of the Independent Hybrid Seed Corn Producers in Illinois the author stated that new improved semesan jr [cf. *R.A.M.*, xvi, p. 444], though volatile, retains its effectiveness on maize seed during long storage periods because when the treated seed is exposed to the air in a bin, a sack, or in the soil, some of the ethyl mercury phosphate slowly forms a gas, while another portion of the mercurial is adsorbed by the seed coat, and cannot be separated from it by water in the form of rain or any other ordinary means. The product is designed to volatilize, in order that it may penetrate into every crack and crevice on the surface of the seed. No essential change has been made in the formula since new improved semesan jr was first introduced six years ago, but the odour has been changed to that of pine and the physical properties have been so modified that there is now little flying dust during treatment. The odour serves the useful purpose of warning the workmen when they are inhaling too much of the powder. As it contains only 1 per cent. ethyl mercury phosphate, the product is relatively safe to use.

MULLER (H. R. A.). **Over het epidemisch optreden van de Gloeosporium-bladziekte bij Djeroek in Oost-Java.** [On the epidemic occurrence of the *Gloeosporium* leaf disease of Citrus in East Java.]—*Landbouw*, xv, 6, pp. 324–345, 16 figs., 1939. [English summary.]

An account is given of a destructive epidemic of withertip of citrus, especially oranges and tangerines, in East Java in 1938, caused by *Colletotrichum gloeosporioides* [*R.A.M.*, xviii, p. 794], which first attacks the young leaves and twigs and involves progressive defoliation and die-back of the shoots. The incidence of the disease was found to depend largely on the state of health of the trees and on soil conditions, severe mortality being registered, for instance, after an intense drought, resulting in desiccation of the root systems, as well as in plantings where stony strata in the subsoil induced stagnation of growth: the adverse effects of the latter factor were particularly marked where the obstruc-

tion was encountered in the upper layers (78·6 per cent. infection compared with 39·6 in the deeper ones).

A connexion was suspected between the development of withertip and the application of sulphur to the citrus roots and surrounding soil for the control of *Armillaria* [loc. cit.], but definite proof of the absence of any such relationship was secured. Spraying with Bordeaux mixture against withertip is regarded as uneconomical, cultural methods of combating the disease being preferable. These should include, besides thorough sanitation of the groves, the substitution of bud-grafting for layering as a mode of propagation, the former tending to produce a vigorous root system capable of withstanding drought and neglect.

McCleery (F. C.). **Black spot of Citrus. A brief summary of control experiments, 1925–39.**—*Agric. Gaz. N.S.W.*, l, 11, pp. 618–622, 4 figs., 1939.

Black spot of citrus (*Phoma citricarpa*) [*R.A.M.*, xix, p. 69] is estimated to cause greater economic loss than any other disease on any crop in New South Wales. Its importance has increased with the increased cultivation of the late-hanging Valencia orange. If hot, dry weather prevails when the fruit reaches maturity early in October outbreaks may occur with great suddenness, and attacks may attain very serious proportions in a few days. Data obtained in spraying trials indicated that much infection occurs soon after blossoming, though the infected fruit appears healthy for as long as 12 months afterwards. The principal infection period probably extends from blossoming to a date some 20 weeks later.

In preliminary tests promising results were given by spraying with Bordeaux mixture at blossoming in October, while much better control was achieved when a second application (6–6–50 or 6–6–80) was made ten weeks later. Spray injury, however, was severe. Further experiments demonstrated that four applications at 3–3–80 yielded 81 per cent. clean fruit, 17 per cent. with trace-medium infection, and 2 per cent. severe infection compared with 13, 43, and 45 per cent., respectively, for the control, but caused severe fruit and tree injury. A profitable degree of control resulted from four applications at 1–1–80 (the corresponding infection percentages being 46, 39, and 16, respectively), this treatment causing no tree damage and giving fruit almost equal to the unsprayed controls in size, colour, and texture. Four applications at 3–3–80 gave better control than two at 6–6–80 and four at 2–2–80 were better than two at 4–4–80, while four at $1\frac{1}{2}$–$1\frac{1}{2}$–80 were better than two at 3–3–80. The very weak sprays tended to hasten re-greening.

The spray programme recommended has already been noticed from another source [loc. cit.]. The Bordeaux treatment should be effected in conjunction with two white oil sprays against scale insects. Risk of spray injury is reduced if the trees are kept in a well-manured and vigorous condition.

Chapman (H. D.), Liebig (G. F.), & Parker (E. R.). **Manganese studies. California soils and Citrus leaf symptoms of deficiency.**—*Calif. Citrogr.*, xxiv, 12, pp. 427, 454; xxv, 1, pp. 11, 15, 5 figs., 1939.

The results of preliminary pot culture fertilizer tests carried out in

1937 on two soil types [*R.A.M.*, xviii, p. 672] in California with lucerne as an indicator crop showed that this crop benefited by applications of manganese to the soils in question. The published evidence of manganese deficiency symptoms in citrus leaves is stated to be somewhat discordant, and accordingly experiments were begun in 1937 with controlled nutrient cultures. Mild symptoms of manganese deficiency in the leaves of lemon cuttings were found to be indistinguishable from those of mild zinc deficiency; as the leaf grows older a stippling with lighter green points and spots commonly but not invariably appears, followed by a slight widening of the green band on either side of the midrib and main veins; small, white flecks produced by the apparent death of epidermal cells develop next, and finally numerous small, brown speckles spread mainly over the upper leaf surface, although some can be seen on the under side.

The mild symptoms produced on leaves of Valencia or sweet orange or grapefruit cuttings grown in the greenhouse in sand cultures supplied with manganese-deficient nutrient solutions maintained at $P_H 7$ (found to contain no trace of soluble manganese) are said to resemble closely those of mild zinc deficiency (mottle leaf), but the lighter blotches remained less yellowish than in the true mottle leaf, and there was no material reduction in the leaf size or total growth of the plants. No symptoms developed in cultures maintained at $P_H 5$, which were found to contain 0·06 p.p.m. of soluble manganese. A Navel orange tree grown for three years out-of-doors in a sand culture unit supplied with a nutrient solution maintained at $P_H 7$ or above had consistently shown manganese deficiency symptoms, while trees grown in the same solutions but with the P_H lowered to 5 or 6 showed none. The leaves of the former had a manganese content of 7 p.p.m. as compared with 20 p.p.m. in those of the latter. The vegetative development of the affected tree was subnormal and the fruit production was markedly reduced, but leaf size was not significantly smaller and no die-back occurred. The leaves of manganese-deficient lemon and orange trees turned green upon treatment with manganese solutions, but zinc treatment had no effect.

Both orange and lemon trees growing in certain areas of southern California have been observed to show symptoms identical with those described above. Leaf analyses revealed a manganese content from 2·7 to 4·9 p.p.m., whereas green leaves from field trees in other areas showed values from 14 to 26 p.p.m. It is concluded that soil alkalinity is one of the factors giving rise to manganese deficiency, the condition being probably also determined by the quantities and kinds of manganese-bearing minerals native to the soils, cultural treatments, the manganese requirement of the crops grown, the phosphate status of the soil, and many other factors as yet not understood.

KLOTZ (L. J.) & TURRELL (F. M.). **Rind structure and composition in water spot of Navel Orange.**—*Calif. Citrogr.*, xxv, 2, pp. 45, 56–57, 5 figs., 1939.

In this paper a discussion of rind anatomy is given in connexion with water spot in Washington Navel oranges [*R.A.M.*, xvii, p. 811]. The walls of the rind cells and the sap of these cells are stated to be very

hydrophilic, and the intercellular spaces, which are minute irregular conduits, also exert a powerful capillary attraction for water. When the waxy surface of the orange is damaged by mechanical injury and the underlying cells exposed, rain water is rapidly absorbed and the affected portion swells to form a blistered area, which may be readily invaded by the blue and green moulds [*Penicillium italicum* and *P. digitatum*]. Saturation of the rind tissues with water affects the semi-permeability of the membranes of the oil gland cells so that the toxic oil is liberated and further damages the tissues.

When untreated oranges were immersed in a 1/10,000 aqueous solution of ruthenium red, a pectin stain which traces the paths of entrance of the water, only a few of the stomata and cells of the substomatal chambers became stained, indicating that only few stomata permit the passage of water; when, however, the oranges were first treated with benzene and alcohol to remove the stomatal plugs and then immersed in the dye, many more stomata were stained. When oranges with uninjured rinds and with the buttons and navels sealed with paraffin were immersed in water together with an equal number of wounded oranges similarly treated with paraffin, the first lot had absorbed at the end of 16 hours 1·25 and the second 8·48 gm. of water, a result which indicates the small importance of stomata for the entrance of water.

No correlation was found between stomatal or oil gland density and the incidence of water spot.

CIFERRI (R.). **Il marciume delle infiorescenze della Palma da Dattero nella Libia Occidentale.** [Inflorescence rot of the Date Palm in Eastern Libya.]—*Agricoltura colon.*, xxxiii, 10, pp. 571–572, 1939.

During a short visit to the oasis of Misurata, Libya, the author observed at the foot of a fully grown date palm an entire inflorescence in full flower which had become detached owing to a rotting of the rachid, separation having occurred at a point where the tissues had become soft and watery. Isolations from infected material in all cases gave *Fusarium moniliforme* [*Gibberella fujikuroi*: *R.A.M.*, xviii, p. 20] and another *Fusarium*, probably a variety of *F. oxysporum*, while in some instances bacteria, *Trichoderma lignorum*, and a Dematiaceous fungus, probably *Aureobasidium* [*Pullularia*] *pullulans*, were also found. The paper terminates with a brief review of the literature dealing with infections of date palms by species of *Fusarium* [cf. ibid., xvi, p. 744]. Further investigations are in progress.

ROELOFSEN (P. A.). **Onderzoekingen over beinvloeding en behoud van de kwaliteit van Robusta-Marktkoffie.** [Investigations on the operative factors in the retention of quality in Robusta market Coffee.]—*Arch. Koffiecult. Ned.-Ind.*, xiii, 3, pp. 151–281, 4 diags., 12 graphs, 1939. [English summary.]

The following items of phytopathological interest occur in this exhaustive survey of the factors involved in the preservation of the quality of coffee (mainly Robusta) from Java estates. Moulds (principally *Aspergillus niger*) were found to attack the green berries after two months' storage at a relative humidity of 75 per cent. and upwards. The natural colour gradually changes to yellow or brown and the

characteristic aroma is replaced by a musty odour; stored at 84 to 93 per cent. humidity the product becomes unfit for consumption, but at 63 per cent. it may safely be kept for 16 months without perceptible deterioration.

MILES (L. E.). **Some tests of varietal susceptibility to a combination of root-knot nematode and Cotton wilt.**—*Phytopathology*, xxix, 11, pp. 974–978, 1939.

Of 17 varieties of upland cotton grown on soil heavily infested with the root knot nematode (*Heterodera marioni*) and wilt (*Fusarium vasinfectum*) [*R.A.M.*, xviii, p. 787] at the Mississippi Agricultural Experiment Station, the highest degree of resistance to both organisms was shown by Clevewilt 6, Cook 144–68 and 307, Dixie Triumph 55–85, Toole (Perry), Sykes W.R., Dixie 14–5, and Dixie Triumph 12, the average percentage of fungal infection amounting to 18·53 as against 36·61 and 79·92 in the intermediate and susceptible groups, respectively. Of 14 exotic varieties and hybrids, one strain of Sea Island (13B3) remained free from wilt throughout the experiment, while another (Andrews) showed 9·61 per cent. infection. Similarly, one strain of Hopi (Sacaton 6 No. 2) contracted only 9·73 per cent. infection, while another (M–34–6–2 No. 6) was 100 per cent. diseased. The average incidence of wilt in the resistant group of exotic varieties was 13·20 as against 87·18 in the susceptible. Except for Sea Island 13B3 all the foreign varieties were liable to nematode infestation, which was particularly severe in the wilt-susceptible group.

MILES (L. E.). **Effect of type and period of storage on Cotton seed after treatment with organic mercury dusts.**—*Phytopathology*, xxix, 11, pp. 986–991, 1939.

In April, 1937, the average increases of emergence and yield in D & PL11A (Deltapine A) cotton seed treated at the Mississippi Agricultural Experiment Station with 2 per cent. ceresan over the untreated control lots stored for periods from 0 up to 5 months (*a*) in the laboratory were 26·9 and 26·7 per cent., respectively, and (*b*) in an outdoor crib 23·3 and 22, the corresponding figures for 2 per cent. new improved ceresan [*R.A.M.*, xviii, p. 787] being (*a*) 18·7 and 26·4 and (*b*) 30·6 and 26·4, respectively. In April, 1938, the average increases of emergence in two lots of ceresan-treated seed planted immediately after disinfection were 19·2 and 19·3 per cent. and of yield 25·4 and 15·8 per cent., the corresponding figures for new improved being 29 and 29·5 and 30 and 25·8, respectively. For two lots of ceresan-treated seed stored for 17 months, (*a*) in the laboratory and (*b*) in the crib, the average increases of emergence were 25·8 and 22·4 per cent., respectively, and of yield 25·5 and 28·7 respectively, the corresponding figures for new improved ceresan being 44·9 and 32·8, 39·1, and 32·6, respectively.

It is apparent from these data that neither the type nor the duration of storage caused injury from the treatment, but that the organic mercury dusts, especially new improved ceresan, substantially increased both emergence and yield even though the seed was relatively free from disease. Some factor other than the elimination of seed-borne infection was evidently involved in the production of this effect, probably the

reduction of an exceptionally high incidence of the soil-borne sore shin and damping-off (*Corticium solani*) [ibid., xviii, p. 105 and loc. cit.].

WATKINS (G. M.) & WATKINS (MATILDE O.). **The pathogenic action of Phymatotrichum omnivorum.**—*Science*, N.S., xc, 2338, pp. 374–375, 1939.

When pure cultures of *Phymatotrichum omnivorum* [*R.A.M.*, xvii, pp. 523, 596; xix, p. 14] were maintained in successive transfers on roots of living cotton seedlings, and a fragment of infected root was placed against the root of a healthy seedling, shrinking and discoloration of the tissues of the healthy seedling adjacent to the piece of infected root generally resulted. This was followed by the development of an encircling and penetrating hyphal weft, which in two or three weeks produced a soft rot of the cortex along the whole root system.

Direct application of drops of liquid squeezed from affected roots was made on to the surfaces of normal cotton seedling roots, healthy roots in a parallel series being treated with drops expressed from diseased roots subjected to the temperature of boiling water for one hour, while similar tests were conducted with liquid expressed from germinating sclerotia. The results obtained showed that the liquid from the unheated, decayed roots was absorbed by healthy roots in four or five hours, and frequently imparted a water-soaked appearance to the tissue at the points of application. This affected tissue shrank, turned yellow or light brown, and formed sunken, necrotic areas, which girdled the root almost to the central cylinder; finally, the epidermis and cortex collapsed into a deeply staining, disorganized mass, while abundant cell division in the pericycle initiated the formation of lateral roots. In the roots treated with liquid from heated decayed roots only a slightly discoloured spot formed, and there was no considerable shrinkage or disruption of tissue continuity, though toxic effects were exerted on protoplasts near the site of application. The experiments with unheated and heated liquid from germinating sclerotia gave results comparable with the foregoing. Further evidence indicated that viable hyphae were seldom, if ever, transferred with the drops, and that the lesions that developed were due to fungal secretions.

GREATHOUSE (G. A.). **Alkaloids from Sanguinaria canadensis and their influence on growth of Phymatotrichum omnivorum.**—*Plant Physiol.*, xiv, 2, pp. 377–380, 1939.

In a further study on the effect of alkaloids on the growth of *Phymatotrichum omnivorum* [*R.A.M.*, xviii, p. 24] the author isolated sanguinarine, chelerythrine, and protopine from roots and rhizomes of the resistant *Sanguinaria canadensis*. When these substances were added to the culture solution, sanguinarine was found to inhibit all growth of the fungus at all concentrations used (100, 50, 10, and 2·5 p.p.m.); chelerythrine acted similarly at concentrations of 100 and 50 p.p.m., but permitted a growth of 3·4 and 73 mg. at concentrations of 10 and 2·5 p.p.m., respectively, compared with one of 369 mg. in the control; while protopine, at the highest concentration, reduced the fungous growth to 81 mg. Both sanguinarine and chelerythrine were found to be present in the host tissues in far greater concentrations than those

inhibiting the growth of the fungus. These results indicate that alkaloids play an important part in the resistance of *S. canadensis* to *P. omnivorum.*

PASCALET (P.). **La lutte biologique contre Stephanoderes hampei ou Scolyte du Caféier au Cameroun.** [The biological control of *Stephanoderes hampei* or the *Scolytus* of Coffee in the Cameroons.]—*Rev. Bot. appl.*, xlix, 219, pp. 753–764, 1 fig., 1 graph, 1939.

A full account is given of the factors governing the successful control of the coffee berry borer (*Stephanoderes hampei*) in the Belgian Congo by spraying the infested bushes with a spore suspension of *Beauveria bassiana* [*R.A.M.*, xv, p. 150; xix, p. 72] from rice-peptone cultures. Prerequisite conditions for the establishment of fungal epidemics among populations of *S. hampei* include swarming of the insects; a temperature of 20° to 30° C.; an initial rainfall providing the parasite with the necessary moisture for intensive sporulation and stimulating the borers to settle on the bushes; a day or two of sunshine to reduce humidity and facilitate the uniform dispersion of the conidia by light air currents; and mists or light showers to promote the development of the conidia which have already reached the integument of females (the number of males attacked is negligible). On entering the body, either through the soft tissues at the insertion of the pronotum, or occasionally by way of the alimentary canal, the hyphae at first paralyse the movements of the insect and then exert a chemical action, killing the host after a maximum period of six days. For the present the problem of combating *S. hampei* by means of *B. bassiana* is considered to be of scientific rather than practical interest.

VIÉGAS (A. P.). **Empusa dysderci n.sp., um nuovo parassita de Dysdercus.** [*Empusa dysderci* n.sp., a new parasite of *Dysdercus*.]—*J. Agron., S. Paulo*, ii, 4, pp. 229–258, 3 pl., 1 fig., 1939. [English summary.]

A comprehensive account is given of the author's studies on a new species of *Empusa*, *E. dysderci* [a Latin diagnosis of which is furnished], parasitic in São Paulo, Brazil, on *Dysdercus mendesi*, *D. ruficollis*, *D. honestus*, and *D. longirostris*, the nymphs of the first instar being particularly susceptible, adults relatively resistant, and eggs completely immune. Infected insects show no apparent signs of abnormality before death, which occurs suddenly and is followed by the luxuriant development of conidiophores covering the entire body with a white bloom, gradually turning chamois-coloured; mummification eventually ensues.

The conidiophores are more or less cylindrical, smooth, hyaline, averaging 15 to 20μ in diameter, simple when developing on the dorsal surface of the nymphs, branched on adults; they originate at the tips of the 'hyphal bodies' or internal mycelium (17 to 58μ in diameter) and reach the exterior of the insect through the integument, which is dissolved by enzymatic action. The primary conidia are roughly globose, smooth, hyaline, multinucleate, 35 to 46 by 30 to 40μ, provided with a conspicuous basal papilla, and containing large oil drops; the secondary are similar but smaller. The zygospores produced in the interior of the tibial and tarsal regions and below the integument of the head are

globose, elliptical, smooth, hyaline, and measure 50 to 60μ in diameter. The mechanism of spore discharge in *E. dysderci*, which is positively phototropic, was ascertained to be analogous with that of *Pilobolus* [*R.A.M.*, xiv, p. 184], the conidia being transparent and acting as convergent lenses. A full description is given of the cytology of *E. dysderci*, which agrees with that of other species of the genus previously recorded.

Pure cultures of the fungus were obtained only with great difficulty on insects autoclaved for 20 minutes at 120° C. Its pathogenicity was demonstrated by laboratory inoculation experiments on *D. ruficollis* and *D. mendesi*, in which up to 100 per cent. infection was obtained, but the value of the organism as a means of combating the cotton-stainers in the field remains to be established by further investigations. The new species differs from the closely allied *E. apiculata* [ibid., xv, p. 779] in the absence of rhizoids.

DESCHIENS (R.). **Conditions de capture des larves de Dictyocaules par des Hyphomycètes prédateurs.** [Conditions for the capture of Dictyocaulous larvae by predatory Hyphomycetes.]—*Bull. Soc. Path. exot.*, xxxii, 7, pp. 698–700, 2 pl., 1939.

Pursuing the studies in progress at the parasitological annexe of the Institut Pasteur, Paris, on the capture of nematode larvae by certain Hyphomycetes [*R.A.M.*, xviii, p. 675], the writer studied the action of *Arthrobotrys oligospora* and *Dactylella bembicodes* on *Dictyocaulus filaria*, the agent of verminous bronchitis in sheep and goats. The fungi were grown on an agar-water medium on to which larvae of various ages were introduced. *Dactylella bembicodes* proved capable of 'garrotting' even the feebly motile embryos of the nematode, while those of the second and third moults were readily captured and strangled. *A. oligospora* was somewhat less actively predacious but effectively disposed of the second- and third-moult larvae. The profuse development of the fungi in question on damp grass, mire, and the surface of stretches of water renders them eminently suitable for prophylactic application in the control of bronchitic strongylosis of ruminants.

DE MONBREUN (W. A.). **The Dog as a natural host for Histoplasma capsulatum. Report of a case of histoplasmosis in this animal.**—*Amer. J. trop. Med.*, xix, 6, pp. 565–586, 3 pl., 1939.

A detailed account is given of the writer's studies (with the assistance of Katherine Anderson) at the Nashville (Tennessee) General Hospital on a case of generalized infection in a dog by a fungus proved to be identical with *Histoplasma capsulatum* [*R.A.M.*, xix, p. 20] in all its phases both in the host tissues and in culture on potato dextrose agar at P_H 6·5 and Sabouraud's medium; it was characterized by hyphae 2·5 to 4·5μ in diameter, intercalary or lateral, sessile or pedicellate, sometimes concatenate chlamydospores, 4 to 10μ in diameter, lateral, sessile or pedicellate, piriform conidia, 2 to 8μ in diameter, and terminal, lateral, or intercalary, spherical or rarely piriform, thick-walled cells, 10 to 25μ in diameter, and covered with rounded projections or tubercles, 5 to 6μ long, radiating from the surface. The yeast-like form of the fungus did not develop on 10 per cent. rabbit blood agar either at room temperature or at 37° C., but was obtained in culture

from the peritoneal tissues of mice inoculated with mycelial suspensions. Infection was transmitted to dogs and puppies by feeding them on cultures of the fungus.

The author has received private information of a number of other cases of histoplasmosis from the unpublished records of physicians, and believes the disease to be more widely prevalent in the United States than the relevant literature suggests. *H. capsulatum* should be sought for in blood films, biopsies of lymph nodes, and in cultures of blood and lymph nodes in obscure cases of splenomegaly and lymphadenopathy.

Solway (L. J.), Kohan (M.), & Pritzker (H. G.). **A case of disseminated blastomycosis.**—*Canad. med. Ass. J.*, xli, 4, pp. 331–336, 5 figs., 1939.

The organism found to be responsible for a fatal case of generalized blastomycosis [which is fully described] in a 48-year-old Italian fruit-vendor at Toronto was identified in pure culture as *Zymonema dermatitidis* or *Blastomyces gilchristi* [*Endomyces dermatitidis*: *R.A.M.*, xix, p. 20].

Baker (R. D.). **The effect of Mouse passage on cultural characteristics and virulence for Mice of organisms causing blastomycosis.**—*Amer. J. trop. Med.*, xix, 6, pp. 547–562, 2 pl., 1939.

In the writer's experiments at the Duke University (North Carolina) School of Medicine, repeated transfer through white mice failed to enhance the virulence towards these animals of two strains of *Blastomyces* [*Endomyces*] *dermatitidis* [see preceding abstract] which had caused human blastomycosis. The yeast form of the two strains was developed from the mycelial stage as readily by direct growth on 10 per cent. rabbit blood agar at 37° C. as by passage through a mouse. No alterations, moreover, were induced in the cultural characters of the strains by the latter process. Several mice revealed evidence of generalized blood stream dissemination of the pathogen.

Baldacci (E.), Ciferri (R.), & Vaccari (E.). **Revisione sistematica del genere Malbranchea Sacc.** [A systematic revision of the genus *Malbranchea* Sacc.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV[a], xi, pp. 75–103, 15 figs., 1939. [Latin and English summaries.]

This is an expanded account of a paper already noticed from another source [*R.A.M.*, xviii, p. 526]. The systematic position of the genus *Malbranchea* is among the Conidiosporales according to Vuillemin's classification, and according to Saccardo's in the group Hyphales-Mucedinaceae-Oosporeae.

Ferrando (M.) & Ceruti (A.). **Ricerche sulla flora micologica dello stomaco in varie gastropatie.** [Researches on the mycological flora of the stomach in various gastric diseases.]—*G. Batt. Immun.*, xxiii, 4, pp. 481–512, 1939. [French, English, and German summaries.]

A number of fungi (including *Cryptococcus hominis* [*Debaryomyces neoformans*: *R.A.M.*, xviii, p. 800]) were isolated from the gastric juices of ten patients suffering from various disorders of the stomach at the

Turin University Hospital. No evidence was obtained, however, that the organisms play any significant part in the etiology of gastric disturbances.

BIZZARRI (M.). **Rilievi in 'vivo' di particolari forme degenerative della 'Blastocystis hominis'.** [The demonstration *in vivo* of special degenerative forms of *Blastocystis hominis*.]—*Pathologica*, xxxi, 577, pp. 475–476, 1939. [German and English summaries.]

In the intestinal tract of a patient suffering from blastocystosis (*Blastocystis hominis*) [*R.A.M.*, xviii, p. 676] the writer detected bodies of all dimensions ranging from minute to 'gigantic', those of fairly large size (17·6 μ in diameter) preponderating. The large forms are considered to represent a degenerative stage of the fungus.

DOWDING (ELEANOR S.) & LEVEY (M. R.). **A mould from the ear.**—*Canad. med. Ass. J.*, xli, 4, pp. 336–339, 10 figs., 1939.

Comparative descriptions are given of *Mucor circinelloides*, a relatively uncommon soil mould [*R.A.M.*, xvi, p. 710; xviii, p. 137] isolated at the University of Alberta, Edmonton, from the ear of a nurse, and two other species previously isolated from the same site, viz., *M. corymbifer* [*Absidia corymbifera*: ibid., xvii, p. 678] and *M. ramosus*. Both *A. corymbifera* and *M. circinelloides* made profuse growth on sterilized ear wax. *M. circinelloides* further resembles *A. corymbifera* in its abundant development at a high temperature (57° C.) and in its pathogenicity to intravenously inoculated rabbits, from the kidneys and liver of which the fungus was recovered.

MINCHEW (B. H.), COLLINS (B. E.), & HARRIS (M. M.). **External ear diseases.**—*J. med. Ass. Ga.* xxviii, 10, pp. 408–412, 1939.

Ten out of 50 patients in Georgia suffering from external ear troubles [*R.A.M.*, xviii, p. 313] yielded fungus cultures, of which eight were identified as *Aspergillus* and two as *Penicillium*.

SASAKI (H.). **Über die Otomycosis, besonders ihre Pilzarten, mit Ausnahme der Aspergillusarten.** [On otomycosis, especially the fungi associated with it, other than species of *Aspergillus*.]—*Fukuoka Acta med.*, xxxii, 10, pp. 1573–1644, 10 pl., 1 fig., 1 graph, 1939. [Japanese, with German summary on pp. 97–98.]

Otomycosis is stated to be more prevalent in Japan than is generally realized, constituting 2·1 per cent. (47 cases) of all the patients treated for ear diseases at Fukuoka in 1936. Apart from *Aspergillus* [see preceding abstract], the following fungi were involved in the etiology of the disease, viz. *Penicillium jantho-citrinum* (11 cases), not previously reported from the ear, *P. eborinum* n.sp. (1), *Scopulariopsis sasakianus* n.sp. (1) [both without Latin diagnoses], *Mycotoruloides alba* (3), and its var. *furcellata* (1).

CASTELLANI (A.). **A brief note on a strain of Monilia (Candida) zeylanoides Cast., isolated from a case of moniliasis of the toes.**—*J. trop. Med. (Hyg.)*, xlii, 19, pp. 292–295, 6 figs., 1939.

Candida zeylanoides [*R.A.M.*, viii, p. 104; xviii, p. 254], isolated from

a case of moniliasis of the toes, is characterized by blastospores normally ranging from 2 by 1 to 6 by 4·5 (average 4 by 2·6) μ but attaining dimensions of 7·5 by 4·5 μ in the condensation water of glucose agar cultures. The fungus is Gram-negative, non-acid-fast, does not liquefy gelatine or coagulate serum, peptonize milk, or produce gas from any of the substances tested; litmus milk is slightly alkalized; acid is formed from glucose, levulose, maltose, galactose, saccharose, and inulin. A deep brownish-black pigmentation develops in a week in arbutin agar cultures kept at 30° C. Positive results were obtained in an inoculation experiment on the foot of a human volunteer. The taxonomy of the fungus in relation to other members of the *C. zeylanica* group [loc. cit.] and allied organisms is briefly discussed.

PULVERTAFT (R. J. V.) & WALKER (J. W.). **The control of air-borne bacteria and fungus spores by means of aerosols.**—*J. Hyg., Camb.*, xxxix, 6, pp. 696–704, 1939.

In an attempt at the Westminster Hospital School of Medicine to develop a method of atmospheric purification applicable to fungus spores, the presence of which in factories and the like is stated to be a source of almost incalculable loss in industry, quite apart from their deleterious effect as agents of allergic disease, the writers conducted experiments with the following organisms: two strains of *Cladosporium herbarum* (reported to have been detected, with various *Penicillium* spp., at an average rate of three spores per l. in a cold storage installation [cf. *R.A.M.*, xviii, p. 468]), *Mucor racemosus*, *Thamnidium elegans*, *Wardomyces anomala* [ibid., iii, p. 52], *Torula botryoides*, *Sporotrichum carnis* [ibid., xviii, p. 180] (all isolated from refrigerators), *Monilia sitophila* [ibid., xvii, pp. 243, 599], *P. commune*, *Mucor adventitius*, and *Aspergillus niger*. Powdered desiccated cultures on 2 per cent. maltose agar were divided into two parts, one of which (controls) was distributed about the test chamber by means of a strong current of air; after a 30-minute interval, plates were exposed for 15 minutes. The other part was similarly distributed and an aerosol composed of resorcinol [ibid., xv, p. 166] and glycerine and sold under the trade name of 'aeryl' introduced into the atmosphere at a concentration of 1 : 500,000; at the end of half an hour plates were exposed for 15 minutes and incubated at 20° C. for 100 hours before counting the colonies.

Although complete sterilization was obtained only in the case of *T. botryoides* and *S. carnis*, the colonies of which on the control plates numbered 184 and 275, respectively, substantial reductions were obtained with the other fungi also, e.g., the numbers of the two strains of *C. herbarum* fell from 'confluent growth' (over 500 colonies) to 38 and 24, respectively, *M. racemosus*, *T. elegans*, and *M. adventitius* to 4, 2, and 6, respectively, and *A. niger* from 450 to 8.

GOHAR (N.). **Mycosis v. pseudomycosis : a record of some fungi isolated in Egypt.**—*J. trop. Med.* (*Hyg.*), xlii, 15, pp. 229–234, 1 graph, 1939.

The author presents a record of miscellaneous fungi isolated from various human disorders in Egypt, and suggests that, in some cases, a diagnosis of true mycosis may be based on scientifically unconvincing

evidence. For instance, none of the species cultured from the sputa of 100 patients suffering from 'bronchomycosis' seemed to have any bearing on the condition. Five cases of tinea cruris unexpectedly yielded *Trichophyton concentricum* [*R.A.M.*, xviii, p. 678], hitherto associated with tinea imbricata. Post-mortem cultures from a case of sprue yielded *Syringospora* [*Candida*] *psilosis* [ibid., xvii, p. 395]. The data presented are regarded as constituting strong grounds for scepticism as to the causal involvement of such species in the diseases under discussion.

JACOBSON (H. P.). **Immunotherapy for coccidioidal granuloma.**—*Arch. Derm. Syph., Chicago*, xl, 4, pp. 521–540, 1939.

Following a review of the literature on the attempted therapy of coccidioidal granuloma (*Coccidioides immitis*), the writer describes ten out of over twenty cases (including that of Farness and Mills) [*R.A.M.*, xviii, p. 800] which he has successfully treated by means of specific vaccines.

MOORE (W. C.). **Diseases of bulbs.**—*Bull. Minist. Agric., Lond.*, 117, 176 pp., 58 figs., London, H.M. Stationery Office, 1939. 4*s*. net.

This valuable, clearly illustrated treatise presents in a readable form the latest available information on fungal, bacterial, virus, and non-parasitic diseases of flowering bulbs, much of the literature published on which during the last 60 years is stated to be confined to scientific periodicals or written in foreign languages. The work is divided into sections dealing with the history, geographical distribution, symptomatology, and control of the various diseases affecting Liliaceae (including the hyacinth, tulip, and lily), Amaryllidaceae (*Narcissus* and snowdrop), and Iridaceae (including gladiolus, iris, and crocus) and with the morphology and taxonomy of the causal organisms. The bibliography comprises 709 titles.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 11, pp. 623–627, 1939.

During the winter and spring of 1939, carnations in New South Wales were affected by a bud rot, first recorded locally in 1935, and causing a loss of £500 to one grower in 1937, in which the affected buds resembled healthy ones partially open, but were decayed, brown, and mouldy inside. The condition was associated with *Sporotrichum* [*Fusarium*] *poae* [*R.A.M.*, vi, p. 395; xi, p. 647; xiv, p. 512], a mite, and sometimes with common moulds, such as species of *Alternaria* and *Stemphylium*. Inoculations with the *Fusarium* reproduced the disease, but no injury resulted when the mite was introduced into the flower-beds. Growers are recommended to remove and burn all affected buds and flowers.

WENZL (H.). **Echter Mehltau auf Cyclamen persicum.** [True mildew on *Cyclamen persicum*.]—*Z. PflKrankh.*, xlix, 10–11, pp. 566–567, 1939.

Cyclamen persicum petals in a Vienna nursery were attacked during the winter of 1938–9 by a mildew causing discoloration, shrivelling, and shedding of the uninfected corollate leaves after flowering. In the

absence of a perfect stage the fungus, which is characterized by elliptical conidia, 30 to 50 by 11 to 20 (average 38 to 44 by 13 to 18) μ, can be identified as an apparently undescribed species of *Oidium*, to be known pending further studies as *O. cyclaminis* [a name proposed without a Latin diagnosis].

LONA (F.). **Nuovi casi di tracheoverticilliosi su Digitalis lanata e Santolina chamaecyparissus.** [New cases of tracheoverticilliosis on *Digitalis lanata* and *Santolina chamaecyparissus*.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV[a], xi, pp. 273–288, 10 figs., 1939. [Latin and English summaries.]

The author reports the presence of a *Verticillium* causing tracheoverticilliosis [cf. *R.A.M.*, x, p. 757] on the rose, apricot, *Digitalis lanata*, and *Santolina chamaecyparissus* in Italy, the last two hosts apparently being new records for this disease.

A detailed account is given of the wilt as affecting *D. lanata*. Each of the affected plants studied showed the presence of two strains of the fungus, the cultural characters of which remained constant and which inoculation tests showed to be equally pathogenic. One strain, referred to as 'a', did not produce sclerotia, while the other, 'b', produced abundant olivaceous-black sclerotia and well-developed aerial hyphae. According to G. H. Berkeley's classification [cf. ibid., vii, p. 301] strain 'a' would fall into the third group, which produces no black discoloration in culture, while 'b' falls into the *V. dahliae* group. According to Wollenweber, however [ibid., ix, p. 6], strain 'b' corresponds to *V. albo-atrum* and 'a' belongs to var. *caespitosum*.

JENKINS (A[NNA] E.), POLHAMUS (L. G.), & HILL (H. H.). **New hosts and distribution of Elsinoe solidaginis.**—*Phytopathology*, xxix, 11, pp. 970–973, 1 fig., 1 map, 1939.

Since the first report of scab (*Elsinoe solidaginis*) on golden rod (*Solidago* spp.) in the southern part of Florida [*R.A.M.*, xv, p. 231], the disease has been recorded from a number of other localities in the same State, Georgia, and South Carolina. The following are tabulated as new hosts of *E. solidaginis*: *S. altissima*, *S. bicolor*, *S. brachyphylla*, *S. caesia*, *S. canadensis*, *S. juncea*, *S. rugosa*, *S. petiolaris*, *S. serotina* and its var. *gigantea*, and *S. ulmifolia*, of which *S. serotina* is the most susceptible, while certain strains of *S. leavenworthii* under comparable conditions appear to be almost completely resistant. The perfect stage of the fungus was further present in abundance on a specimen of *S. fistulosa* sent from Savannah in 1936. A local representative of the Compositae, *Brachychaeta sphacelata*, also contracted severe infection by *E. solidaginis* in the Plant Introduction Garden at Savannah, Georgia.

MCCULLOCH (LUCIA) & PIRONE (P. P.). **Bacterial leaf spot of Dieffenbachia.**—*Phytopathology*, xxix, 11, pp. 956–962, 1 fig., 1939.

Dieffenbachia picta, an attractive ornamental becoming increasingly popular in the United States, has recently been observed to suffer from a destructive foliar wilt affecting all parts of the leaf blade except the midrib. Infection first appears in the form of circular to elongated

spots, up to 1 cm. in diameter, with dull watery-green centres, orange-brown borders, and irregular outer margins, delimited by the veins. When the lesions are numerous and conditions favourable for the disease, coalescence into large, yellow, wilted, dry areas takes place. At this stage the dead leaves are dull tan or light brown, thin, and tough, and the lesions are covered on the lower, and later to some extent also on the upper, surfaces by a waxy, silvery-white, thin layer of exudate.

The pathogen, seven isolates of which fulfilled Koch's postulates, is a bacterium consisting of single or paired rods, the former measuring 0·9 to 2·8 (mostly 1 to 1·5) by 0·3 to 0·4μ. It is motile by a single polar flagellum, capsulate on media containing starch or dextrose, aerobic, Gram-negative, non-acid-fast, liquefying gelatine and blood serum, producing a moderate amount of hydrogen sulphide and ammonia, but no indol (in tests by the Goré method); nitrates are not reduced, starch is hydrolysed to a limited extent, milk slowly peptonized, and litmus reduced. The colonies on beef-peptone agar at 23° to 25° C. are circular, entire, flat, smooth, thin, and translucent, massicot or Naples yellow, attaining a diameter of 2 to 4 mm. in six or seven days. The bacteria made their optimum growth at 30° to 31°, the minimum and maximum temperatures being 5° and 37° to 38°, respectively, and the thermal death point 48°. Desiccation rapidly killed the pathogen, while direct sunlight was lethal in five minutes at 3° to 5°. The organism is named *Bacterium* (or *Phytomonas*) *dieffenbachiae* n.sp.

VIÉGAS (A. P.). **Tomentella bambusina n.sp., causadora da seca do Bambú.** [*Tomentella bambusina* n.sp., the agent of Bamboo wilt.]—*J. Agron., S. Paulo,* ii, 5, pp. 313–326, 1 pl., 1939.

Bamboos (*Bambusa vulgaris*) in a planting at Piracicaba, São Paulo, Brazil, were observed in September, 1938, to be affected by a disease characterized by yellowing of the culms, drooping of the bracts, and shrivelling of the whole plant. Young shoots suffer most severely, becoming completely desiccated. The roots are also invaded, the cortex being entirely rotted and only the central cylinder remaining more or less intact. During the dry season the white to ashen, farinaceous hymenium of the causal organism, which is considered to be a new species of *Tomentella* and named *T. bambusina* n.sp. [with a Latin diagnosis], is conspicuous on the dry bracts of the infected shoots, and with the onset of the rains the mycelium develops in profusion round the culm bases and even on the fallen bracts. The disease appears to be the same as the destructive shoot-rot reported by Whetzel from Bermuda (*Rep. Dep. Agric. Bermuda*, 1921, pp. 36, 39–40, 1922) as due to a *Rhizoctonia*.

T. bambusina, a member of the Thelephoraceae, forms a sub-hymenium 5μ in thickness, bearing clavate, erect, smooth, hyaline basidia, 30 by 7·5 to 8μ, each producing four hyaline, depressed, spherical, slightly echinulate basidiospores, 8·5 to 9μ in diameter, each provided with a basal papilla 2μ in height and germ pore 1·2 to 1·5μ in diameter. It was isolated in pure culture and inoculated into young bamboo shoots either through wounds or applied directly to the uninjured surface, with positive results in the former case only. The pathogen appears to pass from the rainy to the dry season in the

mycelial stage in the bracts, which after 24 to 28 hours in a moist chamber develop the above-mentioned typical white to ashen areas, and if left for a longer period exhibit the persistent, white, flocculent mycelium.

DONALD (C. M.). **Strain variation in Bromus unioloides H.B. et K. (Prairie Grass).**—*J. Coun. sci. industr. Res. Aust.*, xii, 3, pp. 212–226, 1939.

In connexion with a study at the Waite Agricultural Research Institute, Adelaide, on variations in *Bromus unioloides*, resulting in the differentiation of eight distinct types of the pasture grass, mention is made of the frequency of infection by smut (*Ustilago bromivora*) [or *U. bullata*: *R.A.M.*, xvii, p. 45; xviii, p. 441]. All the types examined were either completely susceptible to, or entirely immune from, the smut. Of 54 lines tested, 42 were predominantly of the five types susceptible to smut. In a test in 1937 to determine the relative value of different seed treatments for the control of the disease, infection was totally eliminated by 100 minutes' immersion in hot water (120° F.) and by dusting with an experimental mercurial preparation containing ethyl mercury phosphate as the active principle at the rate of 3 oz. per bush., while formalin, copper carbonate, and ceresan gave 87, 53, and 95 per cent. control, respectively [ibid., xiv, p. 572].

LINDFORS (T.). **En för Sverige ny sotsvamp.** [A smut fungus new for Sweden.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1939*, 4–5, pp. 68–69, 1 fig., 1939.

Attention is drawn to the recent detection, for the first time in Sweden, of *Sphacelotheca* [*Ustilago*] *panici-miliacei* on millet (*Panicum miliaceum*) [*R.A.M.*, xviii, p. 170], one of the fodder grasses newly introduced into the country for experimental purposes.

Bitter pit in Apples.—*Fruit World, Melbourne*, xl, 10, p. 5, 1939.

In response to an enquiry by the Victorian Fruit Marketing Association F. M. Read states that if Granny Smith apples are cooled immediately after picking the onset of bitter pit [*R.A.M.*, xviii, p. 118] is often delayed for several months. In a discussion on this subject at a meeting of the Association W. M. Carne stated that in this variety liability to bitter pit and scald [ibid., xviii, p. 657] is greatest in immature fruit, and the former condition is also associated with light crops and large fruit. Both disorders can be prevented by avoiding immaturity; in most years, Granny Smith apples should not be exported from Victoria before the middle of March. Light-crop trees should be picked about a fortnight later than heavy-crop trees, small fruits on light crops being more susceptible than larger fruits from heavier crops. As a rule, light-crop fruit is unsuitable for export or long storage. Finally, oiled wraps prevent scald but not bitter pit.

HOCKEY (J. F.). **Comparisons of orchard fungicides, 1938.**—*Rep. N.S. Fruit Grs' Ass.*, lxxv, pp. 53–55, 57–58, 1938. [Received January, 1940.]

In 1938, when a most severe outbreak of apple scab [*Venturia*

inaequalis] in Nova Scotia took place as a sequel to a rainfall of nearly 1 in. from 14th to 17th May, the delayed-dormant and pre-pink sprays were the most important in the one-third acre experimental plots of Gravenstein, McIntosh, Cox's Orange, and Wagener, each of which received six fungicidal treatments beginning on 9th May and ending on 7th July. The lowest percentage of foliar infection (0·7) was registered on the plot treated with Bordeaux-iron mixture, and the highest proportion of clean fruit (88·8, 84·7, and 83 per cent. on Gravenstein, McIntosh, and Wagener, respectively) on that sprayed with Bordeaux-catalytic sulphur. The inclusion of lead arsenate in the lime-sulphur sprays definitely enhanced their fungicidal efficiency, which was otherwise not equal to that of Bordeaux mixture in the early treatments. Lime-sulphur-iron sulphate mixture [*R.A.M.*, xi, p. 252], catalytic sulphur, flotation sulphur, and sulphur paste exerted about the same degree of efficacy in scab control on Gravenstein and McIntosh, but the two latter afforded less complete protection to the late variety, Wagener. The spray schedule producing the maximum of clean fruit on all varieties consisted of two Bordeaux sprays followed by four applications of a mixture of 1 gal. lime-sulphur, 4 lb. catalytic sulphur, and 3 lb. lead arsenate in 100 gals. water.

VANDERWALLE (R.). **Un cas de verticilliose sur Cognassier.** [A case of verticilliosis on Quince.]—*Bull. Inst. agron. Gembloux*, viii, 2, pp. 106–110, 2 figs., 1939. [Flemish, German, and English summaries.]

Quince seedlings imported from Holland and France and growing in Belgian nurseries have been found to be affected by a tracheomycosis apparently due to *Verticillium dahliae* [*R.A.M.*, xvi, p. 756]. As the disease was present only sporadically it is assumed that in most cases the seedlings were affected when they were imported. During the first year in the nursery, towards the end of vegetation, the leaves of the affected seedlings turned yellow, withered, and fell prematurely. Grafts, as they developed, at first appeared normal, but during the summer their vegetation became arrested and a progressive withering set in. Affected stems showed a brown discoloration of the wood, sometimes confined to one side of the stem; the discoloration generally spread upwards to the thinnest branches and also extended downwards to the collar.

The fungus isolated from affected material in pure culture on beer-wort did not give the *Verticillium* form, but produced conidiophores bearing oval-oblong, agglomerated conidia of the *Cephalosporium* type, measuring 3·75 to 5·5 by 2·5 to 3μ. The abundant microsclerotia were characteristic of *V. dahliae* [ibid., xi, p. 130]. On this medium the hyphae were hyaline or brown. On Raulin's medium the *Verticillium* form constantly developed, and microsclerotia were abundantly present. On Coons's medium development was closely similar to that on Raulin's.

HAHN (G. G.). **Immunity of a staminate clone of Ribes alpinum from Cronartium ribicola.**—*Phytopathology*, xxix, 11, pp. 981–986, 1 fig., 1939.

In order to verify the hypothesis that the conflicting reports of specific

reaction of *Ribes alpinum* to blister rust (*Cronartium ribicola*) [*R.A.M.*, xviii, p. 772] are due to individual differences in this respect between pistillate and staminate plants, observed but not stressed by Clinton and Miss McCormick [ibid., iv, p. 375], the writer inoculated a clone each of the staminate and pistillate plants in 1937 and 1938 at Yale University, New Haven, Connecticut, with aecidiospores of the rust collected in Connecticut and Maine. All the 2,754 leaves of the staminate clone proved to be immune, whereas those of the pistillate contracted infection. The staminate individuals did not even develop the necrotic foliar flecks associated with blister rust infection on the immune Viking (Norwegian Red Dutch) [ibid., xviii, p. 323], whereas the susceptible American Red Dutch controls bore necrotic lesions and produced teleutosori in small numbers.

Menor (J. G.). **Enfermedades del Plátano, del Guineo y del Rulo** [Plantain, Banana, and 'Rulo' diseases.]—*Rev. Agric., S. Domingo*, xxx, 118, pp. 340–342, 10 figs., 1939.

Popular notes are given on the symptoms of three diseases commonly affecting bananas in the Dominican Republic, viz., bacterial wilt or 'moko' (*Bacterium solanacearum*) [*R.A.M.*, xvi, p. 656], desiccation of the foliage with partial involvement of the stem associated with *Helminthosporium torulosum* and *Cordana* [*Scolecotrichum*] *musae* [ibid., xviii, p. 328], and Panama disease (*Fusarium* [*oxysporum*] *cubense*) [ibid., xvii, p. 730], together with directions for their control. Fungal desiccation is amenable to control by spraying with Bordeaux mixture (2 to 4 lb. per 50 gals., with an adhesive) except in very severe cases, necessitating eradication with gas oil.

Ciferri (R.) & Gaddini (L.). **Il marciume delle Musa da Bacterium solanacearum nell' oasi di Derna.** [The rot of *Musa* species caused by *Bacterium solanacearum* in the oasis of Derna.]—*Agricoltura colon.*, xxxiii, 9, pp. 531–535, 5 figs., 1939.

The two varieties of bananas grown commercially at Derna, Libya, one a local variety and the other the Alexandrian banana (*Musa cavendishii*) are both affected by a disease which reduces the total crop by about 10 per cent. per annum. From infected material an organism was isolated the characters of which agreed with those of *Bacterium solanacearum* [cf. *R.A.M.*, xviii, p. 693]. A full description of the symptoms of the disease is given and the paper terminates with brief suggestions for control by improved cultural practices.

Kanitkar (U. K.) & Uppal (B. N.). **Twig blight and fruit rot of Mango.**—*Curr. Sci.*, viii, 10, pp. 470–471, 1 fig., 1939.

Mangoes in Bombay are affected during the monsoon by a disease which produces rapidly enlarging water-soaked areas on the twigs. The infection quickly spreads upwards, but the twig is never girdled. The affected bark turns dark brown, and the shoot dries up. Diseased material showed the presence of ostiolate pycnidia, 88 to 248μ in diameter (in culture, 56·8 to 145·5μ), with hyaline pycnospores, 16·5 to 26·1 by 4·8 to 6·9μ. The disease causes a black rot of fruits in storage, especially at the stalk end.

An apparently new species of *Phoma* was isolated from naturally affected bark and fruits, and inoculations with pure cultures of the fungus on wounded stems and fruits gave positive results. One- to two-year-old green twigs of Pairi and Alphonso mangoes were highly susceptible, while younger shoots and those with mature bark failed to take infection. Twigs of country varieties were highly resistant.

THURSTON (H. W.) & FREAR (D. E. H.). **The importance of standardized procedures in diluting liquid lime-sulphur.**—*Phytopathology*, xxix, 11, pp. 993–995, 1939.

Recent analyses at the Pennsylvania State College of 30 samples of lime-sulphur concentrate comprising eight commercial brands and five home-made preparations revealed far-reaching variations both in the specific gravity (1·182 to 1·293) and the polysulphide content (10·90 to 25·94 per cent.). To cite two examples, a dilute (1 in 75) spray made from the preparation of highest specific gravity would contain 0·445 per cent. polysulphide sulphur, or more than 2½ times as much as that of the lowest (0·171). The proportions of thiosulphate sulphur in the various samples ranged from 1·71 to 6·05 per cent., high concentrations of this compound generally accompanying a low specific gravity and polysulphide content [cf. *R.A.M.*, xvii, p. 333]. Of the five home-made samples, all but one (which was the best of the whole number examined) were definitely inferior to the commercial brands, the average polysulphide and thiosulphate sulphur contents of the former being 16·70 and 4·05 per cent., respectively, and the corresponding proportions of the latter 22·61 and 2·32 per cent., respectively.

MUSKETT (A. E.). **Biological technique for the evaluation of fungicides.**—Reprinted from *Agric. Progr.*, xvi, 2, 6 pp., 1939.

This is a condensed account of work already noticed from another source [*R.A.M.*, xvii, p. 809].

HIBBEN (S. G.). **Short-wave radiation in the control of fungi and bacteria.**—*Agric. Engng, St Joseph, Mich.*, xx, 11, p. 438, 1939.

The peak of the lethal action of radiant electric energy on micro-organisms [*R.A.M.*, xix, p. 84] occurs at a wave-length of about 2,250 Å (a quality of radiation not found in sunlight at the earth's surface), and during the last few years, which have been marked by an immense increase of interest in the practical applications of the process, it has been necessary to perfect low-pressure mercury vapour discharge lamps supplying a uniformly regulated output of energy in the requisite form [cf. ibid., xv, p. 722]. The cost of installation of a sterilizing lamp unit about 3 ft. long and complete with reflector and controlling accessories is estimated at $30. Well-made ultra-violet tubes are capable of six months' continuous burning, and the electric power consumption is quite low, four 30-inch lamps requiring no more than a single 75-watt lighting bulb. In meat storage chambers the combination of direct and general space irradiation (the latter entailing the application of four lamps to a floor area at the rate of 300 to 400 sq. ft. or 750 cu. ft. air per lamp) has proved effective under proper conditions of humidity and ventilation, while good results have also been obtained

in the control of moulds in bakeries and other branches of food industry [ibid., xvii, p. 418].

Dodge (B. O.). **Some problems in the genetics of the fungi.**—*Science*, N.S., xc, 2339, pp. 379–385, 1939.

In this paper (presented at the Third International Congress for Microbiology, New York, 1939) the author discusses some of the chief problems of myco-genetics, including mutations and segregations in bakery moulds, mendelism in yeast fungi, phenotypic and genotypic sex differences, and double fertilization in Ascomycetes.

Babcock (E. B.). **Recent progress in plant breeding.**—*Sci. Mon., N.Y.*, xlix, 5, pp. 393–400, 1939.

This is a review of some recent outstanding developments in the breeding of plants for resistance to disease and other purposes in the United States, among the diseases discussed from this standpoint being watermelon wilt [*Fusarium bulbigenum* var. *niveum*], black stem rust of wheat [*Puccinia graminis tritici*], and tobacco mosaic.

Verhoeven (W. B. L.). **Overzicht van de belangrijkste ziekten en plagen van landbouwgewassen en hun bestrijding.** [A survey of the most important diseases and pests of agricultural crops and their control.]—*Versl. PlZiekt. Dienst Wageningen* 92, 174 pp., 16 pl., 1939.

This booklet clearly sets out the symptoms of the most important diseases of agricultural crops in Holland, those associated with potash deficiency being described by H. Lindeman. Practical control measures are indicated while a concluding section deals, *inter alia*, with seed disinfection and the preparation of some standard fungicides.

Plant diseases.—*ex* A Handbook of Philippine Agriculture, Coll. Agric., Univ. Philippines, pp. 233–342, 1939.

Brief, practical notes are given on the symptoms, causes, and control of the principal diseases of crop plants in the Philippine Islands.

Sheffield (F[rances] M. L.). **Some effects of plant virus diseases on the cells of their hosts.**—*J. R. micr. Soc.*, Ser. III, lix, 3, pp. 149–161, 3 pl., 1939.

Further investigations into the effects of plant virus diseases on the host cells [*R.A.M.*, xviii, p. 468] showed that some cause no apparent abnormalities, while others lead to the development of inclusion bodies, which in some cases are amorphous, and in others crystalline. The different types of inclusion are compared, and the paper concludes with a discussion of the nature of intracellular inclusions. The plates accompanying the present paper include a number of new illustrations.

Kausche (G. A.). **Über Färbungsmöglichkeiten von pflanzlichem Virus.** [On the staining possibilities of virus material of plant origin.]—*Biol. Zbl.*, lix, 9–10, pp. 536–541, 3 figs., (2 col.), 1939.

Details are given of the procedures adopted in the staining of the common and aucuba tobacco mosaic virus and potato virus X by means of silver nitrate and Victoria blue (Herzberg) [*R.A.M.*, xviii, p. 556].

STANLEY (W. M.). **The architecture of viruses.**—*Physiol. Rev.*, xix, 4, pp. 524–556, 1939.

The author develops the thesis (with particular reference to plant viruses) that it is more fruitful to consider atoms, molecules, viruses, germs, and cells from the point of view of structure than by reference to the living state.

BALDACCI (E.) & CABRINI (ELISA). **Biologia di una Rizottonia usata nelle ricerche di vaccinazione (Rhizoctonia solani var. ambigua nobis).** [The biology of a *Rhizoctonia* used in researches on vaccination (*Rhizoctonia solani* var. *ambigua* nobis.]—*Atti Ist. bot. Univ. Pavia*, Ser. IVª, xi, pp. 23–73, 13 figs., 1939. [Latin and English summaries.]

A full account is given of the authors' morphological, cultural, and physiological studies on the 'toile' disease organism, hitherto regarded as *Botrytis cinerea* [*R.A.M.*, xvii, p. 55] (received through Carbone from Beauverie).

The authors conclude that the fungus in question is a variety of *Rhizoctonia solani*, which they name *R. solani* var. *ambigua* [cf. ibid., xviii, p. 757]. Their reasons for regarding it as a separate variety are (1) that it has become so well known in connexion with plant vaccination studies; (2) it differs from *R.* [*Corticium*] *solani* in the absence of a perfect stage, its non-pathogenicity to potato, its physiological characters, and its lack of zonation in culture; and (3) the measurements of the monilioidal cells differ from those of *Moniliopsis aderholdi*, which the authors regard as synonymous with *C. solani* [ibid., xvii, p. 184].

The studies on plant vaccination carried out with this fungus by different workers should now be revised in the light of the data adduced in the present paper.

YARWOOD (C. E.). **Relation of moisture to infection with some downy mildews and rusts.**—*Phytopathology*, xxix, 11, pp. 933–945, 1939.

The author's inoculation experiments at California University in 1938 with the downy mildews of onion (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xviii, p. 778], spinach (*P. effusa*) [ibid., xix, p. 62], hops (*Pseudoperonospora humuli*) [ibid., xvi, pp. 439, 627, *et passim*], cucumber (*P. cubensis*) [ibid., xv, p. 197], and the rusts of clover (*Trifolium pratense*), beans (*Phaseolus vulgaris*), *Antirrhinum majus*, and sunflower caused by *Uromyces fallens* [ibid., xiv, p. 174], *U. phaseoli* [*U. appendiculatus*: ibid., xix, p. 59], *Puccinia antirrhini* [ibid., xviii, p. 740], and *P. helianthi* [ibid., xviii, p. 128], respectively, were generally most successful when dry spores were dusted on to dry leaves and the infected plants were incubated in moist chambers at a constant temperature. The hop and cucumber mildews, however, were markedly less virulent on the dry foliage than on that to which water was applied by atomization. The infection data were not appreciably modified by the maintenance of the inoculated plants in dry soil or by the use of desiccated spores as inoculum, though some reductions in the number of lesions on unatomized leaves were obtained by the treatments.

Detached *A. majus*, bean, and sunflower leaves in moist chambers

contracted more infection by *P. antirrhini*, *U. appendiculatus*, and *P. helianthi*, respectively, when the inoculated surface was turned downwards than when it faced upwards during the incubation period. The lower temperature in relation to the surrounding atmosphere generally registered by onion leaves kept outdoors at night or in dark moist chambers ($0{\cdot}23° \pm 0{\cdot}07°$ to $0{\cdot}75° \pm 0{\cdot}071°$) is believed to be mainly responsible for the condensation of moisture on the leaves and the resultant favourable conditions for infection. In a humid atmosphere the relatively low leaf temperature is usually sufficient to cause the deposition of enough moisture to induce germination and infection with the fungi studied, but with *Pseudoperonospora humuli* and *P. cubensis* a greater amount of free moisture is probably necessary than with the other species.

DYKSTRA (T. P.). **A comparative study of American and European Potato virus diseases.**—*Amer. Potato J.*, xvi, 11, pp. 281–287, 1939.

This is an abridged version of the author's comparative studies on certain American and European potato viruses, a full account of which has already been noticed [*R.A.M.*, xviii, p. 337]. Of the viruses investigated, all those of European origin except paracrinkle and C were also found to occur in the United States. Leaf-rolling mosaic (virus E) has not been reported from Europe.

DYKSTRA (T. P.). **A study of viruses causing yellow mosaics in European and American varieties of the Potato, Solanum tuberosum.**—*Phytopathology*, xxix, 11, pp. 917–933, 7 figs., 1939.

In this paper the author continues his studies on American and European potato virus diseases [see preceding abstract] by describing his experiments with viruses of the yellow mosaic group. It is concluded that the viruses causing pseudo-net necrosis (from Holland), tuber blotch (from Ireland), and European and American aucuba mosaic are closely related (as was claimed by Clinch and her colleagues [*R.A.M.*, xvi, p. 117]), and that the first two diseases are identical. A hitherto undescribed disease from Canada, tentatively designated Canada streak, is shown to belong to this group, while evidence is presented that American potato calico [ibid., xi, p. 320] is caused by a virus of an unrelated type.

The X-immune seedling 41956, inoculated with the Canada streak virus, sometimes exhibited a blotchy mottling of the lower foliage resembling aucuba, while in other cases stem necrosis and burning of the veins and petioles were observed. Bliss Triumph contracted aucuba mottling of the leaflets and considerable necrosis of the intermediate leaves. In the early stages the second-generation symptoms on Earliest of All, inoculated with Canada streak, were characterized by rugosity of the leaves, which tended to roll downwards, the veins of the lower ones becoming necrotic; the general aspect was suggestive of rugose mosaic. The necrotic spots on the foliage of large plants were reminiscent of early blight [*Alternaria solani*], except for the absence of concentric rings; some yellow blotches also appeared. On Green Mountain the symptoms corresponded in the main with those observed on Earliest of All. The lower leaves of infected Irish Cobbler were

extensively spotted and soon fell, the top ones bore yellow blotches, and there was appreciable stem necrosis, involving the cortex and pith. The intermediate leaves of Chippewa bore necrotic dried areas, but showed scarcely a trace of aucuba mosaic. On the other hand, President developed typical aucuba symptoms on the upper leaves, accompanied by necrosis of the lower and intermediate foliage. The lower leaves of Epicure were chlorotic, but there were no necrotic blotches or streak, whereas Arran Victory showed both aucuba-like symptoms and necrosis. Arran Chief developed particularly severe injury, consisting of scorching and the ultimate shedding of nearly every leaf. The tubers of all varieties revealed an internal blotchy necrosis, originating in the pith, often at the stem end, and in severe cases extending throughout the tuber. These symptoms were not as a rule apparent until about two months after harvesting. Tobacco plants inoculated with Canada streak displayed irregular, white blotches on the upper leaf halves. Young pepper [*Capsicum annuum*] plants contracted foliar and stem necrosis and died within 20 days, while older ones shed their leaves but remained alive. In *Nicotiana glutinosa* the top leaves bore characteristic aucuba spots and the intermediate ones brownish, dried areas, while in *N. sylvestris* shrivelled lesions, 2 mm. in diameter, and small, circular spots appeared on most of the leaves. Serological tests by K. S. Chester confirmed the suspected relationship of Canada streak and aucuba mosaic.

The literature on each disease is briefly summarized.

LOUGHNANE (J. B.). **Myzus ornatus a vector of Potato viruses.**—*Nature, Lond.*, cxliv, 3653, pp. 785–786, 1939.

In three experiments carried out in Dublin, out of 16 healthy potato plants colonized with *Myzus ornatus* from a leaf roll source, 10 developed leaf roll. In two tests of the insect as a vector of potato virus Y, 5 out of 16 healthy potato plants colonized became affected with this virus. As the insect has been found only to a very slight extent feeding on field potato crops in Eire it is probably unimportant as a vector of potato viruses under field conditions. It has, however, been observed on a wide range of hosts, and may, therefore, act as a vector of viruses of other crops.

KENKNIGHT (G.) & MUNCIE (J. H.). **Isolation of phytopathogenic Actinomycetes.**—*Phytopathology*, xxix, 11, pp. 1000–1001, 1939.

The following technique has been found effective at the Michigan Department of Plant Pathology for the isolation of *Actinomyces* [including *A. scabies*] from potato scab [*R.A.M.*, xix, p. 111] lesions and is also applicable to Actinomycetous infections on the roots of other hosts. Diseased tubers are thoroughly washed in tap water, immersed for one minute in 0·1 per cent. mercuric chloride, rinsed, the scab lesions excised with a flamed scalpel, placed in a sterile, cotton-plugged test tube, broken up with a glass rod dipped in alcohol, and shaken with 10 c.c. sterile water. One-tenth to 1 c.c. of the suspension, diluted with 10 c.c. sterile water, is transferred to a Petri dish containing about 20 c.c. of a medium consisting of 1 gm. glucose, 1 c.c. of a 10 per cent. solution of each of potassium dihydrogen phosphate, sodium nitrate, potassium

chloride, magnesium sulphate, and 15 gm. agar per l. distilled or tap water, adjusted to a neutral reaction. The substitution of 1 gm. per l. soluble starch for glucose results in slightly more prolific growth of the Actinomycetes, but the elimination of the fungal and bacterial contaminants commonly present in scab lesions is less complete with this component.

BEELEY (F.). **Annual Report. Pathological Division.**—*Rep. Rubb. Res. Inst. Malaya, 1938*, pp. 115–143, 2 figs., 1939.

This report [cf. *R.A.M.*, xvii, p. 836] contains the following items of interest. The results of large-scale experiments on the treatment of plots of *Hevea* rubber showing root disease (*Ganoderma pseudoferreum*, *Fomes lignosus*, and *F. noxius*) [loc. cit.] before replanting are given by R. P. N. Napper. It was shown that root disease control in connexion with replanting consists of two separate problems, namely, control (*a*) in the infected areas in the original stands for which *G. pseudoferreum* is mainly responsible, and (*b*) in areas outside the old disease patches carrying healthy trees (where *F. lignosus* is the fungus to cause trouble subsequently). A separate study of these two problems on the same site showed, according to expectations, that the rate of incidence of *G. pseudoferreum* provides a measure of relative efficiencies of the different replanting methods in dealing with problem (*a*), and varies inversely with the amounts of digging carried out within the boundaries of the original disease patches, whereas the rate of incidence of *F. lignosus* provides the parallel measure in dealing with problem (*b*) and varies inversely with the amount of digging carried out outside those boundaries. The only exception was the low incidence of *F. lignosus* in plots in which all trees were cut off at ground-level and the stumps poisoned with sodium arsenate. This method is useless for destroying already infected roots but may be of considerable practical value for control in areas outside the original diseased stand. Poisoning hastens the onset of decay and consequently shortens the period between felling and invasion by saprophytic organisms, during which the roots are highly susceptible to attacks by *F. lignosus*. By shortening this period of susceptibility fewer and smaller sources of infection are allowed to develop, with a corresponding reduction of losses in the replanted stand.

The rhizomorphs of *F. lignosus* spread far in advance of the rotten tissue, and the ratio of the number of dead to the total number of infected (both living and dead) trees at the end of 1938 was 43 : 104, the corresponding figures for *G. pseudoferreum* and *F. noxius*, the rhizomorphs of which rarely advance beyond the diseased tissue, being 8 : 9 and 6 : 8, respectively. Nearly 60 per cent. of the *F. noxius* infections were directly traceable to contact with diseased rubber logs, which had probably become infected after felling by means of windblown spores. Generally the costs of treatment during the first year after planting varied inversely with the cost of treatment prior to planting; the costs for stump poisoning were significantly heavier than those for the other treatments.

On coastal soils the replanting problem was chiefly limited to problem (*b*), as only *F. lignosus* was present. In addition to treatment by digging and by the poisoning method, ring-barking (based on Leach's

work on *Armillaria mellea* [ibid., xvi, p. 564]) was tried, and though data regarding disease are not yet available, it was found that ringing 4½ months before felling resulted in a reduction of the starch content of the roots by 5½ per cent. after 3½ to 4 months and by 86 per cent. after 6 months. Trees frill-grilled and poisoned 4 months before felling showed a loss of 98 per cent. after 5½ months, whereas in untreated stumps it was only 4 per cent. during the first 2½ months. There was a fairly close relationship between the rate of loss of starch and the rate of invasion by saprophytic fungi.

In the course of investigations conducted by F. Beeley, mouldy rot (*Ceratostomella fimbriata*) [ibid., xvii, p. 836] was observed in the rare perithecial stage on the tapping panel of rubber trees on an estate in South Perak in July, while the normal dense, white felt of endoconidia was absent. The palm-oil treatment in control of this disease was found to have certain disadvantages, such as slipperiness of the tapping surface, tendency to over-softening of the bark, and decomposition of the palm oil, which, with the sun's heat, causes an over-penetration of the new bark surfaces, killing at least 1 mm. thickness of bark.

Brown bast [ibid., xvii, p. 414] was reported from several areas of budded rubber. The early stages of this physiological disease occur during the dry period between two moist ones and are not easily recognizable, while when the more obvious symptoms appear following a growth flush, prevention is already practically impossible and drastic surgical treatment must be applied. An indication of over-tapping is afforded, however, by an increase in the percentage of dry or brown bast trees in an area above the normal 3 to 5, accompanied by a decrease in the dry rubber content of the latex. If the dry rubber content is examined regularly throughout the period of tapping, serious outbreaks of the disease can be prevented by shortening the length of the cut or increasing the intervals between tappings. On many estates daily records are made of the volume and the dry rubber content of the latex brought in by each tapper, so that changes in the composition of the latex and an onset of the disease can be at once detected.

James (N.). **The accuracy of the plating method for estimating the number of bacteria, Actinomyces, and fungi in a laboratory sample of soil.**—*Iowa St. Coll. J. Sci.*, xiv, 1, pp. 50–52, 1939.

This is a condensed account of work already noticed from another source [*R.A.M.*, xviii, p. 614].

Stark (F. L.), Smith (J. B.), & Howard (F. L.). **Effect of chloropicrin fumigation on nitrification and ammonification in soil.**—*Soil Sci.*, xlviii, 5, pp. 433–442, 4 graphs, 1939.

The effect of soil fumigation with chloropicrin [*R.A.M.*, xviii, pp. 439, 728] on the subsequent rate of ammonification and nitrification was studied in a very fine sandy loam soil at the Rhode Island Agricultural Experiment Station. The total amount of nitrogen made available for plant growth was not substantially increased except by high dosages of chloropicrin, the beneficial effect of which as a soil fumigant is therefore probably due in a large part to the control of undesirable micro-organisms, especially fungi [ibid., xv, p. 518]. Plants cultivated in the

treated soil develop extensive, fibrous, uninjured root systems, the vigorous activity of which is reflected in heavy increases of yield, amounting for instance to 50 per cent. in carrots and onions and to double the normal in pepper [*Capsicum annuum*], tomato, and eggplant.

Hoerner (G. R.). **Calcium cyanamide as a crown treatment.**—*Pacif. Hop. Gr.*, v, 11, p. 7, 1938. [Abs. in *Exp. Sta. Rec.*, lxxxi, 6, p. 798, 1939.]

From 52 replies to a questionnaire circulated to hop-growers in British Columbia, California, and Oregon, it appeared that, generally speaking, the application before hoeing of calcium cyanamide to the soil surface over the crowns at the rate of 2 oz. per plant in a circle about 2 ft. in diameter resulted in good control of downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xiii, p. 396; xvi, p. 439] through the suppression of the basal spikes, besides increasing yields.

Bell (A. F.). **Corn, downy mildew, and Cane.**—*Cane Grs' quart. Bull.*, vii, 1, pp. 43–44, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 12, p. 35, 1939.]

Recent observations in Queensland have demonstrated the readiness with which downy mildew [*Sclerospora sacchari*] can pass from maize to sugar-cane [*R.A.M.*, xviii, p. 549], a fact of special importance in connexion with the P.O.J. 2878 and 213 varieties, valued largely for their resistance to gumming disease [*Bacterium vasculorum*: ibid., xix, p. 116]. The menace of diseased maize to the neighbouring cane crops lies in the rapid spread of the fungus in the former. One infected maize stalk may contaminate the entire crop in a few weeks, whereas not less than a couple of years would be necessary to bring about a similar effect in cane. Thus, by keeping maize at a distance, downy mildew may be excluded from the cane fields or controlled by the immediate eradication of infected stools as they appear.

Guffroy (C.). **Glanures mycologiques. II.** [Mycological gleanings. II.]—*Bull. Soc. mycol. Fr.*, lv, 2, pp. 159–165, 1939.

A list is given of 61 parasitic fungi (mostly Ascomycetes and rusts) and their hosts found by the author in different parts of France.

Balţatu (G.). **Mycoderma als echte Saccharomyceten.** [*Mycoderma* spp. as true Saccharomycetes.]—*Zbl. Bakt.*, Abt. 2, ci, 9–13, pp. 196–225, 3 pl., 7 figs., 1939.

A detailed account is given of the writer's intensive morphological and cytological studies at the Geisenheim (Rhine) Viticultural and Horticultural Experiment and Research Station on 17 strains of *Mycoderma* [*R.A.M.*, xiv, p. 193]. The results of the investigations are considered to leave no doubt as to the position of *Mycoderma* in the tribe Saccharomyceteae of the Stelling-Dekker system [ibid., x, p. 692]. It is proposed to retain *Mycoderma* as a genus with *Mycoderma*, *Pichia*, *Willia*, and possibly *Debaryomyces* as subgenera, the designations of individual species being founded on their predominant ascospore numbers, followed by an index figure, e.g., *M. tetraspora* I (= *M. vini* 15), and *M. bispora* III (= *M. cerevisiae*).

Tai (F. L.). **Notes on Chinese fungi, IX.**—*Lingnan Sci. J.*, xviii, 4, pp. 457–462, 4 pl., 1939.

This annotated list of 16 Chinese true mildews [cf. *R.A.M.*, xvi, p. 840; xviii, p. 552] includes *Leveillula* [*Oidiopsis*] *taurica* on chilli [ibid., xiv, p. 146] and *Erysiphe glycines* n.sp. [with Latin and English diagnoses] on *Glycine* sp. The latter fungus is closely allied to *E. polygoni*, from which it differs, however, in its subcylindrical asci, 63 to 71 by 29 to 33 μ, each occupied by six, rarely eight, ellipsoid to oblong ascospores, 20 to 24 by 10 to 13 μ.

Savile (D. B. O.). **Nuclear structure and behavior in species of the Uredinales.**—*Amer. J. Bot.*, xxvi, 8, pp. 585–609, 106 figs., 1939.

In a cytological study of *Uromyces fabae*, *Puccinia sorghi* [*P. maydis*], *P. malvacearum*, and five other rusts, it was shown by means of the usual and some new staining methods that there are two distinct types of nucleus in this group of fungi, the unexpanded and the expanded. The former is found in the pycnospores and is adopted in every part of the life-cycle where migration of the nucleus through a narrow pore is necessary, while the second occurs in the aecidiospores, uredospores, and teleutospores, and in their basal cells and spore mother cells. The transition of the unexpanded into the expanded nucleus begins with the formation of a new nuclear sphere, the ectosphere, round the original nucleus, then the chromatin passes through the original nuclear membrane and becomes distributed throughout the ectosphere, leaving the original nuclear sphere, the endosphere, completely devoid of it. The endosphere is commonly referred to as the nucleolus, but it is not homologous with the nucleolus of higher plants. With the aid of the Feulgen method, nuclear division was followed in greater detail than was previously possible. In the unexpanded nucleus the spindle is formed equatorially in the single nuclear sphere, while in the expanded it is formed beside the endosphere as a chord to the ectosphere membrane. The division of the nuclei of the mycelium is essentially similar to that of the unexpanded nuclei. It was established that the pycnospore nuclei of *P. maydis* and *U. fabae* enter the thallus through the ostiolar hyphae of the pycnidium. They do not diploidize the cells through which they pass, and though very few introduced nuclei enter each aecidial primordium, complete diploidization is achieved by repeated division after the primordium has been reached.

Tranzschel (W [V].). **Conspectus Uredinalium U.R.S.S.**—426 pp., 37 figs., Leningrad, published by the Academy of Sciences of the U.S.S.R., 1939. Roub. 19 Kop. 20 (bound Roub. 21 Kop. 70).

This monograph opens with a few introductory chapters (pp. 7–57) on the development, taxonomy and nomenclature, host relationships, and geographical distribution of the rust fungi. These are followed by a list of the rusts recorded in the U.S.S.R. (pp. 61–404), together with a certain number of foreign species (given in square brackets) which might be found in the Union later on, as their hosts are present in the country. The rusts are listed first under the hosts arranged according to the natural orders, the localities being indicated, and following each order an annotated list is given of the rusts parasitic on it. A number

of species regarded as new are described [with Latin diagnoses] and various new combinations made. The work constitutes a valuable addition to the Russian literature on the rusts.

DOIDGE (E[THEL] M.). **South African rust fungi, III.**—*Bothalia*, iii, 4, pp. 487–512, 37 figs., 1939.

In continuation of her earlier work [*R.A.M.*, vi, p. 257], the author gives descriptive notes on 43 further species of South African rusts, including 29 new species [with Latin diagnoses] and one *nomen novum*. *Puccinia iridis* [ibid., xvii, p. 397] is recorded as having recently appeared on *Iris germanica* growing in gardens in Johannesburg and *Uromyces limonii* on *Limonium latifolium* in commercial gardens in Pretoria and Hartebeestpoort.

BUGNICOURT (P.). **Les Fusarium et Cylindrocarpon de l'Indochine.** [The *Fusarium* and *Cylindrocarpon* species of Indo-China.]—(*Encycl. mycol.*, Vol. XI), 206 pp., 10 pl. (6 col.), 36 figs., Paris, Paul Lechevalier, 1939. Fr. 165.

For seven years the author has been isolating species of *Fusarium* and *Cylindrocarpon* from the major crops, the forest trees, the food plants, and the ornamentals of Indo-China. From this material he presents a detailed description of 29 species, varieties (2 new), and forms of the first, and 10 species, of which 8 are new, of the second. Five associated perithecial forms are also described. He regards the genus *Fusarium* as adequately covered by the 65 fundamental species with their varieties and forms, as maintained by Wollenweber [*R.A.M.*, xiv, p. 708]. A notable feature of the present work, however, is the large number of new host plants from which established forms of *Fusarium* have been isolated for the first time, e.g., all the 15 host plants of *F. vasinfectum*, 27 out of the 28 of *F. equiseti* var. *bullatum* [ibid., xvii, p. 154], and 41 out of the 42 of *F. solani* var. *minus* [ibid., xiv, pp. 297; xvi, pp. 174, 813]. The microscopic features of each form are illustrated in text figures or microphotographs, and the macroscopic features of 16 selected forms in the coloured plates. The particulars of each form are set out as follows: (i) the accepted name and its synonyms; (ii) the host plants from which it has been isolated in Indo-China; (iii) its world distribution and the hosts from which it has been previously recorded; (iv) its macroscopic characters drawn up from at least five subcultures as its grows on a number of different media; and (v) its macroconidia, microconidia, and chlamydospores treated separately. The spore measurements, taken from at least 500 spores, are tabulated in classes according to the number of septa, and are repeated for isolations from a number of different host plants. This work will no doubt be a valued addition to the literature on *Fusarium* and *Cylindrocarpon*.

MARTIN (L. F.), BALLS (A. K.), & MCKINNEY (H. H.). **Protein changes in mosaic-diseased Tobacco.**—*J. biol. Chem.*, cxxx, 2, pp. 687–701, 4 graphs, 1939.

In a previous paper the writers indicated the principle of a method for the differentiation of the trypsin-resistant virus nucleoprotein of tobacco mosaic from the trypsin-digestible normal protein [*R.A.M.*,

xviii, p. 480], and they here give full directions for the application of two alternative procedures for the determination of protein changes in diseased plants, together with the results obtained thereby.

After the inoculation of young Wisconsin-Havana plants with tobacco virus 1 the virus protein at first accumulates by the displacement of an equivalent amount of normal proteins. After three days in the lower and six in the upper leaves, a very rapid increase in virus protein concentration begins, accompanied by a rise in total nitrogen and total protein, and by the appearance of macroscopic symptoms. The maximum concentration of total virus protein in the lower leaves (about 34 mg. per gm. dry weight) was attained five days after inoculation, the corresponding figures for the upper being approximately 43 mg. and ten days. A gradual decline in the concentration of virus protein then ensued, while the normal protein reverted to the level found in the healthy controls. In the very resistant Ambalema variety the same sequence of changes took place in a less pronounced form, the non-digestible virus protein disappearing much earlier after reaching a maximum concentration of only a third of that detected in the susceptible Havana. The extremely resistant Type 448A did not respond to inoculation by the accumulation of virus protein in measurable amounts. The latter variety also showed a consistent decrease in the total nitrogen content as a result of infection in place of the characteristic increase in the susceptible Havana. Neither Ambalema nor Type 448A manifested any external symptoms during the period of the tests.

In general, the amounts of virus indicated by the assays of sap infectivity on Scotia bean [*Phaseolus vulgaris*] by the half-leaf inoculation method paralleled the analytical data as to the relative quantities of virus protein in the susceptible, very resistant, and extremely resistant genotypes.

The observations herein described may be interpreted on the basis either of direct conversion of normal into virus protein, or of competition of normal and virus protein syntheses for available nitrogen, coinciding with an acceleration of the total nitrogen assimilation and protein synthesis.

WENHOLZ (H.). **Spotted wilt of Tomatoes. Breeding for resistance.**—*Hawkesbury agric. Coll. J.*, xxxvi, p. 103, 1939. [Abs. in *Plant Breed. Abstr.*, x, 1, p. 15, 1940.]

At the Hawkesbury Agricultural College [New South Wales], N. I. Shirlow is crossing cultivated tomatoes with *Lycopersicum pimpinellifolium* in order to obtain resistance to spotted wilt [*R.A.M.*, xviii, p. 825], and another apparently immune Peruvian species is also under observation. Antibes and a few other varieties have so far remained free from the disease under local conditions.

HORSFALL (J. G.) & MCDONNELL (A. D.). **Effect of wind on blossom-end rot of Tomatoes.**—*Plant Dis. Reptr*, xxiii, 18, pp. 307–308, 1939. [Mimeographed.]

The effect of wind in aggravating outbreaks of blossom-end rot of tomatoes [*R.A.M.*, xviii, p. 637] was illustrated by counts made in a

field in Connecticut. The tomato rows ran at right angles to the direction of the wind, and the plants were trained on stakes 5 ft. high. The number of affected fruits per 50 ft. of row was 42 in the outside row most exposed to the wind, the figures for the next six rows being, respectively, 27, 17, 12, 4, 9, and 5.

WELLMAN (F. L.). **A technique for studying host resistance and pathogenicity in Tomato Fusarium wilt.**—*Phytopathology*, xxix, 11, pp. 945–956, 1 fig., 1 diag., 1939.

A laboratory-greenhouse technique has been devised at the United States Horticultural Station, Beltsville, Maryland, for the study both of the pathogenicity of the tomato wilt organism (*Fusarium bulbigenum* var. *lycopersici*) [*R.A.M.*, xix, p. 7] and the relative resistance to the disease of strains and varieties of the host. The seedlings were grown for four to six weeks in sterilized soil in a warm greenhouse (27° C.), and the inoculum was derived from cultures of the fungus grown on Tochinai's liquid medium (10 gm. peptone, 0·5 gm. monopotassium phosphate, 0·25 gm. magnesium sulphate, 20 gm. maltose, and 1,000 c.c. water). After washing, the roots were dipped in the inoculum and planted out in sterilized soil (2 parts of coarse sand to 1 of potting soil) at a temperature of 25° to 28° in a greenhouse atmosphere of 24° to 30°. The period required for the establishment of host-fungus reactions in growing plants in the test beds averaged about a week. The severity of the disease was determined by means of a system of numerical evaluation ranging from 0 (no apparent disease) to 15 (early wilt and collapse).

The following are some of the observations made on this basis in seven tests. A few plants of the resistant Red Currant variety showed fairly severe symptoms a week after inoculation, but shortly outgrew them and proceeded to develop normally. Some of the tolerant Marglobes showed similar reactions, though others remained mildly stunted throughout the full period (39 days) of the observations, and certain badly affected plants died within 17 days. The susceptible Bonny Best was killed in 7 to 28 days, and in some instances plants of this variety displayed virulent symptoms as early as four days after inoculation.

BAKER (R. E. D.). **Notes on the diseases and fruit rots of Tomatoes in the British West Indies.**—*Trop. Agriculture, Trin.*, xvi, 11, pp. 252–257, 1939.

In 1939 the following organisms were found associated with rots of tomato fruits in Trinidad [*R.A.M.*, xi, p. 609; xii, pp. 121, 794], St. Vincent, and Montserrat, the fruit being picked when full but still green and then allowed to ripen at 75° to 85° F.: *Bacillus* [*Erwinia*] *aroideae*, which is one of the most important tomato fruit parasites in the West Indies, various species of *Fusarium* and *Phomopsis*, and *Botryoplodia theobromae* causing soft rots; species of *Fusarium* and *Phomopsis* causing a firmer brown rot; *Phoma destructiva, Cladosporium fulvum*, and a species of *Guignardia* causing smaller, slow-growing dark lesions; and *Phytophthora infestans* and *P. parasitica*, liable to cause severe damage during wet weather. Most of the soft rotting is attributed to careless handling and to the export of fruits already damaged by

mechanical or insect injury. It was experimentally shown that the rapidly growing soft-rotting fungi can be largely eliminated by selecting unblemished, sound fruit, leaving only the slower-growing species, which develop later and do not damage the commercial shipments to the same extent. The primary infection of the fruit is stated to take place in the field. A type of latent infection [ibid., xvi, p. 395], remaining dormant until the fruit ripens, is occasionally produced by *Colletotrichum gloeosporioides*, *Phomopsis* spp., *Phoma destructiva*, *Cladosporium fulvum*, and *Guignardia* sp. in sound, unripe tomatoes, but the majority of infections are caused by fungi entering the fruit through cuts, bruises, growth cracks, blossom-end rot lesions, and injuries due to sucking insects, such as *Phthia picta*, *Leptoglossus balteatus*, and *Nezara viridula* [ibid., xi, p. 610]. When 50 carefully selected fruits were left to ripen for a fortnight, 21 developed blemishes, mostly small, black spots caused by *Phoma destructiva*, with small holes in the centre apparently made by one of these insects. These spots were invisible when the fruits were green, the infections taking place through the wounds having apparently remained dormant until the fruit reached a stage of maturity favourable for further development. The following suggestions are made for the reduction of wastage: careful cultivation to produce good fruit of correct size and free from cracks and wounds; control of the larger sucking bugs; picking the fruit at the proper stage of maturity; cautious handling during picking, grading, and packing; and the exclusion of all damaged fruits.

Notes are appended on various organisms causing diseases of the tomato in the West Indies, including the following in addition to those listed above: several species of *Alternaria* and *Macrosporium* (including probably *M.* [*A.*] *solani* and *M.* [*A.*] *tomato*) [ibid., xviii, p. 766], *Colletotrichum phomoides*, *C. falcatum* (occurred twice in 1939), *Corticium solani* (not found in 1939 but present on other crops in Trinidad), *Rhizopus* spp. (of little importance), various unidentified species of *Helminthosporium* (of no commercial importance), *F.* [*bulbigenum* var.] *lycopersici*, *Sclerotium rolfsii*, and *Bacterium solanacearum*, any of the three last-named being able to cause serious losses from wilt besides infesting the soil for many years.

Atanasoff (D.). Горска патология. [Forest pathology.]—404 pp., 188 figs., Университетска Библиотека [University Library], 204, Imprimerie de la Cour, Sofia, 1939.

This is a fully documented text-book intended for students of forest pathology. The subject is discussed in six chapters dealing, respectively, with physiological, virus, bacterial, and fungous diseases of trees, parasitic phanerogams, and the preparation of fungicides.

Chorin (M.). **Cytospora chrysosperma on Populus nigra.**—*Palest. J. Bot.*, R Ser., ii, 2, pp. 251–288, 1 fig., 1939.

Cytospora chrysosperma [*R.A.M.*, xviii, p. 642] was observed causing yellowing and defoliation of poplars (*Populus nigra*) at Tel Aviv, Palestine, in April, 1939. The perfect stage of the fungus (*Valsa sordida*) [ibid., x, p. 418] has not developed either in nature or in culture.

Leach (J. G.) & Valleau (W. D.). **Two reports on phloem necrosis of Elm.**—*Plant Dis. Reptr*, xxiii, 18, pp. 300–301, 1939. [Mimeographed.]

J. G. Leach reports that elm trees in the south-west of West Virginia are being rapidly killed off by phloem necrosis [*R.A.M.*, xviii, p. 147]. Known to have been present for several years in the vicinity of Huntingdon, where several thousand elms have succumbed to it, the disease appears to be spreading fast, the number of trees killed by it in any given locality increasing every year. It has been observed as far east as Cedar Grove (about 20 miles east of Charleston) and as far north as Parkersburg. Trees of all ages are susceptible and even the largest may be killed in one season. Potentially, the disease is at least as dangerous as Dutch elm disease [*Ceratostomella ulmi*]. No effective means of control are known. The situation is further complicated by the presence in the western half of West Virginia of *Scolytus multistriatus*, which breeds abundantly in the dead trunks. *C. ulmi* itself is present in Athens county, Ohio, within 20 miles of Parkersburg.

W. D. Valleau states that elm phloem necrosis has been present near Lexington, Kentucky, for over ten years. It has killed about 50 per cent. of the elms on one estate, where more are still dying, and has killed many elms on others. Only transplanted trees, 5 to 15 years after transplanting, seem to be affected. All the dying trees are stated to have originated outside Kentucky, the native trees (some of which are 75 to 100 years old) on the estates in question being unaffected.

Peace (T. R.). **The resistance of Elms to the disease caused by Ophiostoma (Ceratostomella) ulmi.**—*Leafl. Imp. For. Inst.* 2, 4 pp., 1939. [Mimeographed.]

Evidence obtained in England failed to show that *Ulmus vegeta* possesses more resistance to *Ceratostomella ulmi* [*R.A.M.*, xix, p. 124] than the varieties commonly grown, while small-scale tests indicated that *U. montana fastigiata* was susceptible and that *U. montana fastigiata aurea* (*wredei*), a tree that makes somewhat poor growth, possesses some resistance. The Jersey elm (*U. stricta wheatleyi*), owing to its upright growth, is well suited for street planting, but frequently becomes infected. As a rule, the damage is not very severe, appearing chiefly as a die-back of the twigs, which seriously reduces the growth rate, but does not kill the tree as a whole, or its large limbs, and is, therefore, not very disfiguring. The resistant Asiatic species are mostly small and do not grow well in England. The most valuable are *U. pumila* and its var. *pinnato-ramosa*, *U. parvifolia*, and the variety of the last-named known in the south-western United States as *U. sempervirens*. In Great Britain and northern Europe *U. parvifolia* and *U. pumila* grow slowly and suffer from winter die-back and infection by *Nectria* [cf. ibid., xvii, p. 142; xviii, p. 354]. The best of the Dutch sections and the only elm selected for resistance that has been generally distributed as yet is *U.* Christine Buisman. It somewhat resembles *U. wheatleyi*, but its habit is much less upright. Attention is drawn to the fact that resistant elm varieties grafted on *U. montana* may suffer severe damage if the fungus reaches the stock; in Holland *U.* Christine Buisman has been widely propagated on susceptible stocks, a practice

which should not be followed in England. This variety, and trees such as *U. pumila* and *U. parvifolia*, while resistant to the fungus, are not immune.

In selection and breeding work in England no really resistant seedling of *U. montana* has been found, and one uniform planting of *U. americana* has failed to yield any promising trees. A number of quite resistant individuals have, however, been selected from a batch of plants raised from seed collected in central Europe and sold as *U. campestris*. These trees appear to be hybrids. In the summer of 1938, a number of healthy elms in the areas worst affected in Great Britain were heavily inoculated experimentally, and with one exception no appreciable damage resulted. Propagation from these trees is now progressing, but the progeny will require further testing.

Ark (P. A.). **Bacterial leaf spot of Maple.**—*Phytopathology*, xxix, 11, pp. 968–970, 1 fig., 1939.

A disease of maple (*Acer macrophyllum*), characterized by a profuse dark brown or black spotting of the leaves, accompanied in severe cases by petiole and bracket cankers, has recently been observed in California. It is similar to the disorder of *A. trifidum* and other species described by Ogawa from Japan as due to *Phytomonas* [*Pseudomonas*] *acernea* [*R.A.M.*, xvii, p. 358], but the causal organism of the present disturbance, a uni- or biflagellate bacterium, was found to differ on beet extract-peptone agar cultures in various respects, including its larger dimensions (0·8 to 2·5 by 0·3 to 0·8 μ), temperature relations (optimum 13° to 31° C.), capacity to reduce nitrates and to form hydrogen sulphide in lead acetate agar, and its greyish-white colonies with slight fluorescence in the medium: it is accordingly named *Phytomonas aceris* n.sp. Inoculation experiments with a suspension of the pathogen on *A. circinatum*, *A. negundo* and its var. *californicum*, and *A. palmatum* gave positive results under humid conditions.

Hedgcock (G. G.). **Notes on North American Pine-Oak species of Cronartium on Castanea, Castanopsis, and Lithocarpus.**—*Phytopathology*, xxix, 11, pp. 998–1000, 1939.

A tabulated account is given of the writer's inoculation experiments, carried out with the aid of R. N. Hunt and G. G. Hahn at the Bureau of Plant Industry, Washington, D.C., at various times between 1909 and 1930, with *Cronartium cerebrum* [*R.A.M.*, xvii, p. 359], *C. conigenum* [ibid., xiii, p. 738], *C. fusiforme*, *C. strobilinum* [ibid., ii, p. 3], and an unidentified *Cronartium* from evergreen oaks on eight species of *Castanea*, five of *Castanopsis*, and *Lithocarpus densiflora*. The *Cronartium* species under observation were found to differ not only in the dimensions of their fruiting and spore forms, but also in their effects on plants inoculated under comparable greenhouse conditions.

Roldan (E. F.). **Damping-off of seedlings in forest nursery.**—*Philipp. J. For.*, ii, 3, pp. 225–233, 1 pl., 5 figs., 1939.

According to an unpublished report by T. Delizo (Division of Forest Investigation, Los Baños, Laguna, 1933), seedlings of the following

broad-leaved trees are susceptible to damping-off in the Philippines: *Adenanthera microsperma, Elaeodendron anfractuosum, Cedrela mexicana* (which suffers almost as severely as conifers), *Aleurites moluccana, Cinchona* sp., and *Carludovica palmata*. In the writer's studies on forest tree seedlings (including pine and the Panama hat palm [*C. palmata*]), *Pythium* (chiefly *P. ultimum*) [*R.A.M.*, x, p. 569] developed in about 60 per cent. of 250 isolations, *Rhizoctonia* in 23 per cent., and *Fusarium* in 17 per cent. A brief account is given of the life-history of the fungi and their mode of infection, with directions for control by soil treatment with sulphuric acid (1 in 160, 1 l. per sq. ft. or 1 in 80, 500 c.c. per sq. ft. in wet soils) or formalin (1 in 100, 4 l. per sq. ft. or 1 in 50 in wet soils, same rate of application), the site to be left for 12 to 14 days before planting.

Yolores (B. Y.). **Extent of defects of some Dipterocarp species in northern, central, and south-eastern Luzon.**—*Philipp. J. For.*, ii, 2, pp. 185–199, 1939.

Fungi of the *Fomes* group, including *F. applanatus* [*Ganoderma applanatum*] and *G. lucidum*, have been found responsible for various defects, the incidence of which ranges from 5 to 31 per cent., in merchantable timber of *Dipterocarpus grandiflorus, Shorea palosapis, Anisoptera thurifera, S. polysperma*, and *Pentacme* [*S.*] *contorta* in the Philippines.

Reichert (I.) & Avizohar (Zehara). **An anatomical study of the fruit-body of the wood-rotting fungus Ganoderma lucidum (Leys.) Karst. in Palestine.**—*Palest. J. Bot.*, R Ser., ii, 2, pp. 251–288, 4 pl., 1 fig., 1939.

This is a detailed account of the authors' intensive anatomical studies on the fruit bodies of *Ganoderma lucidum* [*R.A.M.*, xv, p. 684 and preceding abstract], the agent of severe damage to various trees, including fruit trees, in Palestine. The fungus often occurs only in its mycelial stage, when it is difficult to differentiate it from other indigenous wood-rotting fungi, notably *G. applanatum*.

Five distinct hyphal systems were found to be involved in the construction of the fruit bodies from seven hosts of the fungus, namely, almond, plum [ibid., xii, p. 9], *Ceratonia siliqua, Eucalyptus* sp., mulberry (*Morus alba*), olive, and orange budded on sweet lime: these are the skeletal, constituting the somatic portion of the fruit body and the dissepiments; the generative, giving rise to the crust and hymenium; the binding, serving to strengthen and consolidate the texture of the organ; the palisade, forming an external protective layer; and the plectenchymatic, closely uniting and compacting the tissues. The skeletal system is believed to be self-contained, developing zone by zone from the primordium onwards, each zone being formed from the plasmatic parts of the skeletal hyphae of the preceding zone. The white strands permeating the fructifications were found to contain pale hyphae which exert a cytolytic action on the tissues they traverse and so induce the formation of cavities occupied by internal spores, or gasterospores, first described by S. R. Bose (*Mycologia*, xxv, pp. 231–234) for this fungus.

Ramirez (I.). **Schizophyllum commune Fr.—a forest products-rotting fungus.**—*Philipp. J. For.*, ii, 2, pp. 121–143, 2 pl. (1 col.), 1939.

Full particulars are given of the writer's studies in 1937–8 in the northern portion of Makiling National Park, Laguna Province, Philippine Islands, on the host range of *Schizophyllum commune* [*R.A.M.*, xviii, p. 490], the factors favouring and inhibiting its development, the effect of the fungus on its hosts, and control methods.

The mycelium of the organism was found to vary according to the host, being pinkish-white on the bark of *Swietenia mahagoni* and appearing as a white, cottony weft on the surface of sapwood or any white wood. In light-coloured wood the affected parts are pale tan or pale grey, darkening as the rot advances. Sometimes the decay occurs in zones, of which the innermost is light brown or tan, the second pale grey, and the third very dark grey to black. Badly decayed wood is so soft that it crumbles on pressure.

Inoculation experiments with the fungus are described. Positive results were obtained on fresh samples of *Celtis philippinensis* and *Leucaena glauca*, oven-dried *Parashorea* [*Shorea*] *plicata*, and kiln-dried rattan (*Calamus* spp.). Within blocks of *Aleurites trisperma* [*A. moluccana*] measuring 5·4 by 2 by 1 or 2 by 1 by 1 in. the fungus is able to develop in the presence of a moisture content above 18 per cent., and did not succumb to 16 days' exposure to a temperature of 46° C. or 48 hours at 100° in the presence of sufficient moisture, but no revival took place among the blocks kept in an oven for 96 hours at 100°. Six pieces of *A. moluccana*, two 4·4 by 2 by 1 and four 2 by 1 by 1 in., attacked for 72 days by *Schizophyllum commune* lost 7 per cent. of their oven-dry weight. In painted wood infection takes place through fissures or other apertures; an inspection of the coal tar-treated electric light and telephone posts in the Park revealed the fungus in 20 out of 34 (58 per cent.), replacement being necessary in some cases after four years' service. On living trees the fungus enters through wounds on dead branches. The fruiting bodies require plenty of oxygen for normal development.

The most effective means of control is the utilization of all severely infected material for firewood. Storage of all susceptible species in places where the moisture content can be maintained at or below the critical point of 18 per cent. is also important, while there is some prospect of the biological elimination of the fungus by an insect belonging to the Pyralidae, further studies on which are necessary, however, before making any recommendations for its general use.

Garcia (L. A. A.). **A Mahogany seedling blight in Puerto Rico.**—*Caribb. Forester*, i, 1, pp. 23–24, 1939. [Spanish summary. Mimeographed.]

Attention is drawn to a destructive outbreak of disease in August, 1939, among six-months-old seedlings of the valuable West Indian mahogany (*Swietenia mahagoni*) in the Insular Forest Nursery, Guanica, Puerto Rico. The first perceptible symptom is the development of a discoloured area along the leaf margins, especially the apical portions, which present a necrotic appearance; the dingy yellow to dark brown areas gradually extend towards the petiole and the diseased leaves

finally drop. The causal organism was identified as a hitherto undescribed species of *Phyllosticta*, *P. swietenia* n.sp. [with a diagnosis in English only], characterized by numerous amphigenous, ochreous, lenticular to globose, erumpent pycnidia, scattered over the necrotic parts of the leaf, 190 to 285 by 95 to 135 μ in diameter, furnished with a distinct, black-bordered ostiole, 20 μ in diameter; and hyaline, granular, ellipsoidal conidia, 5·7 to 7·6 by 2·8 to 3·8 μ. Infection is favoured by excessive moisture and dense shading, which induce optimal environmental conditions for conidial germination.

Swanson (H. E.). **Blister rust control in the Inland Empire.**—*J. For.*, xxxvii, 11, pp. 849–852, 1939.

White pine blister rust [*Cronartium ribicola*], accidentally introduced into British Colombia about 1910 and discovered in Vancouver in 1921, is stated to have spread to five western States of the American Union, namely, Washington, Idaho, Oregon, Montana, and California [*R.A.M.*, xv, p. 336; xviii, pp. 216, 562]. The first infected white pines were observed in the Inland Empire in 1927, though the disease appears to have reached the region in 1923. In 1936 about 4 per cent. of the young trees in two sections of northern Idaho were visibly infected, while elsewhere in the area under investigation the incidence of the rust ranged from a fraction of 1 to 1 per cent. In 1937 there was 13 per cent. visible infection on young white pines in the St. Joe (Idaho) National Forest.

Four methods are in use for the elimination of *Ribes* from the 2,710,129 acres of white pine forest deemed to be of sufficient commercial value to justify the cost of protection [cf. ibid., xvii, p. 149], of which hand-pulling or grubbing is the most widely employed, 1,700,851 acres having been covered, and 320,111,677 bushes destroyed, by this means, corresponding to percentages of 94 and 98, respectively. In places where the bushes cannot be readily eradicated for various reasons, they are cut off through or below the crown and the exposed portions of the crown or roots left in the ground are treated with 2 oz. of a dry mixture of borax and sodium chlorate [ibid., xviii, p. 359]. *R. petiolare* in alluvial bottom lands can only be destroyed by spraying with sodium chlorate. Two mechanical methods, the 'bulldozer' tractor [loc. cit.] of caterpillar type and hand-slashing, are necessary for the clearance of the dense concentrations of *R. inerme* which are also supported by alluvial bottom lands.

A survey made in 1934 in northern Idaho showed that on five infected areas, containing 7,701 pines, where *Ribes* eradication was initiated in 1929 and 1931, 13·2 per cent. of the trees were found to be diseased, 12·6 before the work was commenced and only 0·6 afterwards. Of 10,620 trees examined in the Clearwater National Forest (Idaho) in 1938, 368 were found to be infected, 338 before the eradication operations of 1929 to 1933 and only 30 (0·3 per cent.) in subsequent years. Permanent control is considered to have been achieved over some 891,600 areas, or 52 per cent. of the entire area covered, by a single working.

Details are given of the four broad ecological types of land in the Inland Empire destined for *Ribes* eradication, comprising (1) newly

disturbed or denuded areas on which the young conifer stand has only recently started, favouring the appearance and persistence of *Ribes*; (2) coniferous stands of pole and merchantable size with such a light forest density as to permit continued *Ribes* growth; (3) the same, with heavy forest density precluding the occurrence and reproduction of the alternate rust host; and (4) the narrow belt along streams over which the coniferous canopy is broken, allowing of the permanent occurrence of brush and promoting the natural increase of *Ribes*. Working methods will of course be adapted to the requirements of the different types, of which (1) will normally require three workings at three-year intervals, (2) and (3) only one (sometimes two in the former case), and (4) at least three; the last-named type represents only 6 per cent. of the total area involved. To date a single working has sufficed to establish a *Ribes*-free condition on 35 per cent. of type (1) area, 66 per cent. of (2), and 82 per cent. of (3).

It was estimated that, despite the progress made in blister rust control in the Inland Empire, about 850,000 acres of valuable white pine stands (30 per cent. of the eradication area) would remain unprotected at the close of the 1938 season. Lumbering is one of the key industries of the region and western white pine [*Pinus monticola*] the key tree, its value representing 75 per cent. of the value of the forest products consumed within and exported from the Inland Empire. In addition to the large unprotected acreage a substantial reworking programme is necessary, and at present the spread of the blister rust is rapidly outstripping the progress of control operations.

The Swiss leaf-cast disease of Douglas Fir.—*For. Abstr.*, i, 2, pp. 69–71, 1939.

This is a review, based largely on the literature on the subject and on manuscripts in the possession of the Imperial Forestry Institute, of the present state of knowledge concerning the needle-fall disease of Douglas fir [*Pseudotsuga taxifolia*] caused by *Phaeocryptopus gaeumanni* [see next abstract].

LIESE [J.]. **The occurrence in the British Isles of the Adelopus disease of Douglas Fir.**—*Quart. J. For.*, xxxiii, 4, pp. 247–252, 3 figs., 1939.

During the spring of 1939, the author paid a five days' visit to Eire, in the course of which he observed Douglas fir trees [*Pseudotsuga taxifolia*] attacked by needle fall (*Adelopus*) [*Phaeocryptopus gaeumanni*: *R.A.M.*, xviii, p. 827] at Rathdrum, Camolin, Aughrim, Glencree, Emo Park, Ravensdale Property (near Dundalk), near Bray, and in Powerscourt gardens and their vicinity. Every stand seen was badly attacked; in a few localities particular strains were so severely diseased as to raise grave doubts as to the future development of the stands. The disease was first observed in Eire in 1928, but had probably been active before then. In no case, however, had any tree been killed, perhaps because the plantations are established on grassland, where the honey fungus [*Armillaria mellea*] has obtained no hold, whereas in South Germany trees weakened by *P. gaeumanni* are readily attacked by *A. mellea*. On trees over 30 years of age the damage caused was negligible. In experimental plots of 15-year-old trees near Dundalk raised from seed from

Shuswap, Vancouver Island, and Louis Creek, the same amount of infection was apparent in each, but only a moderate amount of damage was caused in the first two whereas the third was considerably damaged. These differences in degree of attack are attributed to different degrees of susceptibility in the various races of Douglas fir. On account of the disease, the Eire Forestry Department has greatly restricted the use of this species.

Rhabdocline [*pseudotsugae*: loc. cit.] was observed on one plot of Colorado Douglas fir, a slow-growing mountain form.

GERLINGS (J. H. J.). **Herkomstonderzoek van den Douglasspar aan de afdeeling houtteelt van het Instituut voor Boschbouwkundig Onderzoek.** [Analysis of origin of the Douglas Fir at the silvicultural section of the Forestry Research Institute.]—*Ned. Boschb.-Tijdschr.*, xii, 10, pp. 405–432, 1 graph, 1 map, 1939.

In connexion with an intensive analytical study on the influence of the place of origin on the subsequent development of Douglas firs (*Pseudotsuga douglasii* or *P. glauca*) [*P. taxifolia*] in Holland, the writer mentions that the *viridis* forms are immune from attack by *Rhabdocline pseudotsugae* [see preceding abstract], the *caesia* slightly, and the *glauca* highly susceptible [*R.A.M.*, xviii, p. 3]. From 1937 to 1939 the fungus was more prevalent in the north-east of the country than in the central districts and least in evidence in the south. A similar distribution was observed in the case of *Lophodermium pinastri* on pines. The *glauca* and *caesia* forms of *P. taxifolia* suffer little damage from *Phomopsis pseudotsugae* [ibid., xiv, p. 264; xviii, p. 490] which occurs more or less severely, however, on *viridis*.

ZEROVA (Mme M. Y.). Хвороба Ялини, викликана грибом **Phomopsis piceae sp.n.** [A disease of Spruce caused by the fungus *Phomopsis piceae* n.sp.]—*J. Inst. Bot. Acad. Sci. Ukraine, 1939*, 20 (28), pp. 137–143, 6 figs., 1939. [English summary.]

During 1936–7, a die-back of five- to eight-year old spruce (*Picea excelsa*) trees was observed in a nursery near Kieff, preceded by a yellowing and dropping of the needles and a shrivelling of the branches. No fungus fructifications were found on the surface of the trees, but mycelium pervaded the inner bark and wood from the root base upwards; isolations in culture constantly yielded an undescribed species of *Phomopsis*, which is named *P. piceae* [with a Latin diagnosis]. Other fungi present were *Pestalozzia hartigii* [*R.A.M.*, xvii, p. 84], *Fusarium* sp., and *Alternaria* sp., but *Phomopsis piceae* is believed to be the causal agent, although preliminary inoculation experiments gave negative results.

The fungus developed pycnidia on beer wort agar and Raulin's medium; they were black, uni-, bi- or trilocular, with a round ostiole, at first slightly flattened, with a broad base, 0·4 to 1·3 by 0·2 to 0·7 mm., but later large, cylindrical, 1 to 2 by 5 to 6 mm.; the conidiophores were indistinct and the α spores were oblong-oval, biguttulate, 5 to 9 (rarely 9·5) by 1·8 to 2·3 μ and the β spores filiform, curved, sometimes straight, 18 to 24 by 1 to 1·5 μ.

DAVIS (W. C.) & LATHAM (D. H.). **Cedar blight on wilding and forest tree nursery stock.**—*Phytopathology*, xxix, 11, pp. 991–992, 1939.

Phomopsis juniperovora [*R.A.M.*, xviii, p. 444] was isolated in 1937 and 1938 on 3- to 20-year-old natural reproduction of red cedars (*Juniperus virginiana*) in North Carolina and on the same host (2 to 8 years old) in Tennessee; in 1938 the fungus was also isolated from red cedar nursery stock in the same two States, Virginia, and Iowa. Attempts to combat the disease by means of fertilizing with ammonium sulphate or a 4–10–4 fertilizer were definitely unsuccessful, the losses caused by the disease being about twice as great as on unfertilized plots. The costs of drastic roguing and spraying with Bordeaux mixture would probably be disproportionately high in relation to the results achieved.

GOIDÀNICH (G.). **Il cancro del Larice prodotto la Dasyscypha willkommii.** [Larch canker produced by *Dasyscypha willkommii*.]—*Riv. for. ital.*, i, 9, pp. 30–35, 8 figs., 1939.

In this account (based largely on the literature of the subject) of larch canker (*Dasyscypha willkommii*) [*R.A.M.*, xviii, p. 74] the author states that the disease was first recorded in Italy in 1800, but that it does not seem to have caused much damage locally, and not much attention has been paid to it. In view, however, of the commercial importance of forests to Italy to-day, every care should be taken to see that the disease does not spread. In one infected area (near Vetviolo, in the Val Sugana, altitude 1,600 m.) observed by the author in 1939, where reafforestation appeared to have been carried out, many trees three to four years old were severely infected, and the condition of the older, diseased trees showed clearly that the attack had taken place during the first few years after planting. Some of the trees had died or were badly wilted, and even those less severely affected would produce inferior timber.

The author recommends that all trees showing even the first symptoms of the disease should be removed wherever they are found, especially in new plantings. The lower branches, particularly if they have died, should be cut off and burnt. Finally, larch trees should never be planted in unsuitable localities, and wherever possible they should be mixed with broad-leaved varieties.

DAY (W. R.). **The diseases of the Larch.**—Abs. in *Rep. Brit. Ass.* (New quart. Ser. 1), p. 114, 1939.

The author expresses the view that physical and biotic factors are responsible for disease in European larch in Britain. Failures of the tree have been due probably to lack of appreciation of the fundamental requirements of the tree or of the physical character of the habitat into which it has been introduced [*R.A.M.*, xvii, p. 360]. Fungus parasites and insect pests are of secondary importance, as is also silvicultural treatment, though this may be an important factor predisposing to disease.

A handbook of home-grown timbers.—vi+87 pp., London, H.M. Stationery Office, 1939. 2*s.*

A handbook of Empire timbers.—vii+214 pp., London, H.M. Stationery Office, 1939. 3*s.* 6*d.*

Both these volumes are planned on the same lines, the first dealing with 26 hardwoods and 9 softwoods, and the second with 79 hardwoods and 17 softwoods. After a general introduction, separate sections are devoted to each species, containing a description of the tree and its timber, together with notes on the durability and other properties of the latter, including (where such information is available) its resistance to attack by wood-destroying fungi and its permeability to preservatives.

Findlay (W. P. K.) & Pettifor (C. B.). **The effect of sap-stain on the properties of timber. III. Effect of sap-stain on the modulus of elasticity of Scots Pine sapwood.**—*Forestry*, xiii, 2, pp. 146–147, 1939.

In further tests on the effect on the strength of Scots pine sapwood of staining due to *Ceratostomella coerulea* [*R.A.M.*, xviii, p. 829], the modulus of elasticity (1,000 lb. per sq. in.) was reduced from 1,430 before staining to 1,420 when the amount of staining was none or slight (58 results) and from 1,450 before staining to 1,410 when staining was moderate to heavy (25 results). These reductions amount, respectively, to 0·7 and 2·8 per cent., of which only the latter is significant. From a practical point of view, however, the decrease, even in the more heavily stained timber, may safely be neglected.

Carswell (T. S.) & Hatfield (I.). **Pentachlorophenol for wood preservation.**—*Industr. Engng Chem.*, xxxi, 11, pp. 1431–1435, 3 figs., 1939.

This is a summary of the researches to date by the writers and others in the United States on the use of pentachlorophenol as a timber preservative [*R.A.M.*, xviii, p. 5], demonstrating the exceptional value of the chemical for the treatment of millwork.

Foulon (A.). **Holzimprägnierung.** [Wood impregnation.]—*Z. Papier* (formerly *Zbl. PapIndustr.*), lvii, 21–22, pp. 277–279, 1939.

An account is given of recent developments in timber-preservation methods in Germany. The saving of coal tar oil by the use of the economical Rueping process [*R.A.M.*, xix, p. 58], as compared with the full-pressure system, is estimated at one-quarter. Of late years coal tar has been largely replaced by the Wolman salts, especially in mines, where timber treated by the former substance is unsuitable by reason of its inflammability and detrimental effects on health. Moreover, some 60 per cent. of the commercial coal tar oil constituents are needed for motor transport. A method has therefore been devised of combining the remaining 40 per cent. (the viscous fractions) with Wolman salts [see above, p. 129] in such a way as to ensure double and first-class protection of the wood.

The arsenic, hydrofluoric, and fluosilicic acid colour bases possess

an insufficient penetrative capacity unless combined with non-aqueous solvents, such as coal tar, phenols, and alcohols, whereby excellent results are obtained. Another effective preservative consists of an aqueous solution of the silicic acid esters of phenols, e.g., $Si(OC_6H_5)_4$. Other efficient solvents for wood preservatives include organic halogen compounds, which themselves exert a strong protective action. Trivalent arsenic compounds have been found more efficacious than the quinquevalent for timber impregnation. Copper and zinc are resistant to lixiviation and lend themselves to combination with arsenic, while a further improvement is embodied in a new patent (DRP 636,873) by R. Falck involving the use of cold neutral aqueous arsenic trisulphide solutions in colloidal form.

WICHT (H.) & SCHULZE (B.). **Untersuchungen über das Osmose-Holzschutzverfahren unter Benutzung des Scheibenverfahrens.** [Investigations on the method of timber protection by osmosis using the disk technique.]—*Holz Roh- u. Werkstoff*, ii, 11, pp. 384–386, 3 figs., 1939.

A fully detailed account is given of the writers' investigations at the Timber Biology Institute, Dahlem, Berlin, on the applicability of the osmosis technique of timber preservation [*R.A.M.*, xix, p. 58] to pine, spruce, and beech wood, with special reference to penetrability under varying conditions. The protectives were applied to decorticated green wood blocks in paste form at rates between 300 and 800 gm. per sq. m. and left for ten days. During this period the dinitrophenol component of the preservative penetrated the wood to a depth of 12 mm. or more and the fluoride salts upwards of 40 mm., the course of the latter being followed by means of a yellow-staining zircon-alizarin reagent supplied by the I. G. Farbenindustrie. Both heart and sapwood were permeated to a very considerable extent in a relatively brief period. Results of this order were obtained, for instance, with the soluble osmol UA (one part plus six of water), with the addition of a special colloidal substance, recently put on the market, at the rate of 5 to 6 per cent. by weight, on green, spring-felled pine wood at 20° C. The omission of the colloid reduced the extent of penetration by about half. At a temperature of 40° the treatments were generally less effective, though even under these conditions satisfactory penetration of both components was secured in some instances. The efficacy of the osmosis method of timber preservation against wood-destroying fungi and insects is considered, however, still to require further trials.

KALNIŅS (A.) & LIEPIŅS (R.). **Technical properties of Latvian coniferous timber (Pinus silvestris L., Picea excelsa Lk. and Larix europaea DC.) with relation to conditions of growth.**—*Rep. Latvian For. Res. Sta.*, x, 85 pp., 12 figs., 1 diag., 13 graphs, 3 maps (1 col.), 1938. [Latvian summary. Received September, 1939.]

This paper contains information on the methods which are being tested in Latvia for the prevention of wood rots and blueing (*Ceratostomella pilifera*) [*R.A.M.*, xvi, pp. 358, 787] in pine (*Pinus sylvestris*), spruce (*Picea excelsa*) [*P. abies*], and larch (*Larix europea*). A recent

development in this direction consists in the artificial increase of the natural resin content. In the case of pine, the bark is removed above the part of the trunk most liable to attack one summer, or preferably several, before felling and the area systematically enlarged until almost the whole of the sapwood below the initial site of decortication becomes saturated with resin, the content of which may be raised from 2 per cent. in the sapwood and 4 to 10 in the heartwood to an average of 15 to 16 per cent. *Lentinus squamosus* [*L. lepideus*] is the only fungus liable to infect wood thus treated. Incisions in the tree should be made at six- to seven-day intervals from May to August, the bark being peeled off in vertical strips during the first summer and in horizontal ones, 3 to 25 cm. in width, in succeeding years, leaving one uncut strip, 5 to 8 cm. wide, between the intact parts above and below the injured portion. The preservation of one normal-sized telegraph or telephone pole by this means costs only about 3*d.*

Spruce wood, with its very low resin content (0·7 to 1 per cent.), is particularly liable to fungal invasion. The increase of resin, carried out as directed for pine, is stimulated by the application to the decorticated surface of 60 per cent. sulphuric acid, 20 per cent. potassium hydroxide, or 3 per cent. carbolic acid, and covering for 10 to 14 days with moss or the peeled-off bark to prevent too rapid drying. The cost of preservation of a spruce pole is 3d. to 7d. according to the method employed. For the prevention of blueing phenol derivatives, mercuric chloride, or sodium fluoride are recommended.

Where impregnation has to be carried out on unprepared poles the osmosis technique [see preceding abstract] should be adopted, using 10 kg. of preservative salts, e.g., osmolit UA, per 6 to 10 l. water, plus 5 per cent. of an adhesive, such as starch paste, molasses, waste cellulose, or glycerine. After treatment the poles, in triangular piles, are covered with waterproof oiled paper, conifer branches and sphagnum, or peat and half-rotten straw, and left for two to three months, during which period the salts sink deeply into the wood (dinitrophenol 10 to 20 mm., mercuric chloride 20 to 30 mm., instead of only 2 to 5 mm. by ordinary immersion), half the final depth of penetration usually being reached in the course of the first week. The extent of penetration is generally about 20 per cent. less in spruce than in pine except in the case of mercuric chloride and copper sulphate. Osmosis can be carried out equally well in summer or winter.

The calorific capacity of blue-stained spruce wood was found to be reduced by about 1 per cent. in comparison with that of normal specimens.

LYNCH (P. R.). **Brown heart in Swedes. Minimum application of 15 lb. borax per acre will usually give satisfactory results.**—*N.Z.J. Agric.*, lix, 4, pp. 319, 320, 2 figs., 1939.

The results of field trials on the control of brown heart of swedes [*R.A.M.*, xviii, p. 565] conducted in various localities in New Zealand during the 1937–8 season showed that excellent control of the disease was obtained in nine experiments with applications of borax broadcast after sowing, a minimum quantity of 15 lb. per acre being usually sufficient to give satisfactory results. In three experiments, however, only

fair control was obtained and in two localities the treatment was inexplicably ineffective.

Van Schreven (D. A.). **Symptômes peu connus du manque de bore chez les Betteraves sucrières, présages de la pourriture du cœur proprement dite.** [Little known symptoms of boron deficiency in Sugar Beets, precursors of heart rot proper.]—*Publ. Inst. belge Amélior. Better.*, vii, 4, p. 329, 1939.

From 1936 to 1938, inclusive, especially during August, September, and October, sugar and fodder beets [? in Holland] were observed to show local swellings of the midrib and lateral veins, sometimes accompanied by longitudinal fissures. In certain instances only one leaf or a few of the outer ones were affected, the remainder of the plant appearing quite normal. This symptom, designated 'vein rot', is attributed to a transitory boron deficiency, which may well develop into heart rot proper unless arrested by timely soil treatments [see next abstract].

Decoux (L.) & Roland (G.). **La pourriture du cœur de la Betterave en Belgique, les signes précurseurs, les dégâts causés par la maladie et les moyens de lutte.** [Beet heart rot in Belgium, the precursory symptoms, the damage caused by the disease, and the means of control.]—*Publ. Inst. belge Amélior. Better.*, vii, 4, pp. 335–338, 1939. [Dutch translation on pp. 338–340.]

On 17th June, 1939, the writers observed in certain beet fields, notably in the Mielen-sur-Aalst district of Belgium, a curling of the leaves, especially the outer ones, and a swelling, blackening, and abrupt outward curving of the midribs and sometimes also of the secondary veins: these symptoms have been described by van Schreven [see preceding abstract] as precursors of heart rot [*R.A.M.*, xviii, p. 79 and above, p. 132], and should be a signal for the immediate application of boron, particularly on alkaline soils in dry seasons. Statistical calculations have shown that the disease may reduce the sugar content of the roots by 30 per cent., besides impairing its purity, the adverse effects being more pronounced in varieties with poorly developed leaves than in those with luxuriant foliage, which incidentally may be entirely destroyed in severe cases. Preventive treatments of boron should be given in the form of borax (10 to 20 kg. per hect.) or boric acid (7 to 14), while remedial applications (where the first premonitory signs have appeared as reported above) should consist in a top-dressing of boron mixed with sand or spraying at the rate of 10 to 20 kg. borax in 1,000 l. water per hect. Observations have shown that heart rot is more troublesome in sparsely planted fields, particularly in the case of scanty-leaved varieties, the average incidence among which is 21 per cent. compared with 16 for those with abundant foliage.

Stirrup (H. H.). **Root rots of Sugar Beet.**—*Brit. Sug. Beet Rev.*, xiii, 8, p. 218, 1 fig., 1939.

Post-lifting root rots of beet, though of rare occurrence in England, may on occasion be responsible for heavy damage, as for instance at the end of the 1934 season in Lincolnshire, when a disease closely resembling that known as 'tail rot' on the Continent caused a loss of

40 to 50 tons in one field and a reduction in the sugar content even of mildly infected roots from 17 to 12 per cent. A large, rod-shaped bacterium isolated from the diseased roots gave negative results in inoculation tests on healthy beets, but produced discoloration and rotting of steam-sterilized slices, accompanied by the exudation of beads of slime similar to those observed on affected roots in the field. The organism, therefore, probably accelerates decay of which it is not the primary agent. Diseased roots left lying in or near the field soon became covered with a crust composed of numerous fungi, the commonest of which was a *Fusarium* inducing a pink discoloration of the substratum but not definitely established as the original cause of the disease. Infection is probably soil-borne.

KRÜGER (H.). **Sclerotium rolfsii Saccardo an der Zuckerrübe.** [*Sclerotium rolfsii* Saccardo on Sugar Beet.]—*Kühn-Arch.*, xlviii, pp. 233–281, 4 pl., 9 figs., 1939.

A comprehensive, fully tabulated account is given of the author's cultural, morphological, and pathological studies at the Halle Agricultural and Plant Breeding Institute on *Sclerotium rolfsii* from sugar beet [*R.A.M.*, xviii, p. 76]. The material studied comprised a strain of the fungus reported to be causing losses of up to 60 per cent. of the yield near Seville, Spain, *Corticium rolfsii* (Sacc.) Curzi [ibid., xiv, p. 196] from the Centraalbureau voor Schimmelcultures, Baarn, Holland, two strains of *S. rolfsii* from sugar beet in California (J. B. Kendrick), two from Roumi and Belau chillies in Egypt, and one from an unspecified source from New South Wales. There were no morphological or cultural differences between any of the strains, but evidences of antagonism were observed when certain strains were cultured on the same dish [ibid., vi, p. 56].

Sugar beets (Kleinwanzleben E), mangolds, and red beets inoculated with the various strains contracted typical wilt symptoms and collapsed in a few days with signs of extensive decay. *Beta maritima*, *B. trigyna*, *B. procumbens*, *B. patellaris*, and various other Chenopodiaceae were also attacked. The progress of the fungus in the host tissues is at first inter- and subsequently intracellular, and its destructive action was found to involve two distinct processes, a lytic and a toxic, of which only the former, consisting of two main components, is discussed at length in this paper. The mycelium secretes oxalic acid, the function of which, contrary to accepted opinion, is claimed to be lytic rather than toxic, inasmuch as it combines with the calcium of the cell walls to form an oxalate, and stimulates the development of pectinase. *S. rolfsii* also elaborates cellulase, which in comparative tests hydrolysed beet cellulose more rapidly than that of paper. The fungus proved incapable of penetrating a collodion membrane. The hyphae pass from one cell to another by constriction of the hyphal tip. Here again, however, evidences of lytic action were not wanting, and it is probable that the hyphal mechanism is purely contributory.

Of the various sources of nitrogen added at the rate of 0·5 per cent. to cultures of the Spanish strain of *S. rolfsii* on a synthetic nitrogen-free medium only the nitrates of potassium, calcium, and ammonium promoted sclerotial growth, which was virtually suppressed by asparagin

and urea; these substances, and eventually also the slowly acting glycocol, stimulated mycelial development. Added at the rate of 5 per cent. to a synthetic medium pectin induced abundant formation of medium-sized, spherical sclerotia (800 to 900 per dish) resembling those observed on the host; cellulose acted similarly, though the sclerotia were much smaller, while xylan and mannite (10 per cent.) gave rise to bodies of abnormal shape, and soluble starch inhibited the development of the resting stage. The mycelium of germinating sclerotia was killed by 12 hours' exposure to a temperature of —2° to — 5° C., but a fresh one was produced by the same sclerotia on transference to optimum conditions at 28° to 32°, with an atmospheric humidity of 80 to 90 per cent. The minimum temperature for the growth of all the strains was 8° to 9° and the maximum 38° (40° in the case of the Spanish strain).

ROLAND (G.). **Étude des maladies à virus de la Betterave et de l'Épinard effectuée en 1938.** [A study of the virus diseases of Beet and Spinach carried out in 1938.]—*Publ. Inst. belge Amélior. Better.*, vii, 2, pp. 67–96, 6 figs., 1939. [Dutch, English, and German summaries.]

In further studies at Wageningen, Holland, in 1938, on the virus diseases of beet and spinach [*R.A.M.*, xviii, p. 429], the writer ascertained by greenhouse experiments that the symptoms of beet virus yellows [see next abstracts] are more pronounced and typical at 17° than at 30° C. The disease was less in evidence among plants grown at a high soil temperature (25°) than at 12°, probably owing to the stronger foliar development of the former. Nitrogen was again shown to mask the symptoms of yellows. Under the conditions of these tests atmospheric humidity exerted no marked influence on the course of the disease. In addition to spinach, *Chenopodium album*, *C. purpureum*, *Beta cicla viridis*, *Amaranthus retroflexus*, *Atriplex hortensis*, and *A. sibirica* have been found to act as hosts of the virus. A sojourn of half an hour on a healthy beet was found to suffice for the production of infection by *Myzus persicae*, which absorbs the virus from a diseased leaf in an hour. The repeated treatment of infected seed crops with nicotine failed to prevent the spread of yellows to adjacent beet stands. There was no difference under greenhouse conditions in the susceptibility to yellows of beets sown on 20th February and 20th March. Differences in varietal reaction to the disease were also not apparent under glass, though *B. maritima* in the field sustained relatively little damage. Starch was shown to be formed less rapidly in diseased than in healthy foliage, the higher starch content of diseased leaves being due to its accumulation and not to a greater photosynthetic activity [ibid., xv, p. 417]. The symptoms of virus yellows developed sooner and were more severe on beets grown in a humus-sand mixture than in pure humus. The general appearance of the half-sugar Giant Red Claudia suffering from yellows is red rather than yellow.

A further symptom of the 'black wood vessel' (*Pythium*) disease of beets, in addition to the features already enumerated by Quanjer [ibid., xiv, p. 209] serving to distinguish it from virus yellows, consists in the negative reaction to Sachs's stain for starch of the interveinal leaf tissues.

Winter spinach in the Maastricht and Hague districts is affected by virus yellows and by another virus of the mosaic type, apparently identical with cucumber virus 1 [ibid., xvi, p. 680], judging by its symptoms on its own hosts, beet, cucumber, tobacco, and *Nicotiana glutinosa*, and temperature relations.

DECOUX (L.) & ROLAND (G.). **Aire de dispersion de la jaunisse de la Betterave dans les différents pays betteraviers en 1938.** [The range of distribution of Beet yellows in the several Beet-growing countries in 1938.]—*Publ. Inst. belge Amélior. Better.*, vii, 2, pp. 61–66, 1939. [Dutch, German, and English summaries.]

From the replies to a questionnaire issued at the instance of the eighth meeting in January, 1938, of the International Institute of Beet Researches, it appears that virus yellows [see preceding and next abstracts] occurred during 1938 in Belgium, Spain, France, Holland, England [cf. *R.A.M.*, xviii, p. 226], Germany, Denmark, Luxemburg, Sweden, and probably the United States, causing the heaviest damage in the first five of the countries listed.

ROLAND (G.). **Contribution à l'étude des maladies des taches noires de la Betterave.** [A contribution to the study of the black spot diseases of the Beetroot.]—*Publ. Inst. belge Amélior. Better.*, vii, 3, pp. 171–178, 2 figs., 1939. [Dutch, German, and English summaries.]

Previous experiments and observations showed that *Alternaria* sp. can only induce leaf scorch (black spotting) of beet leaves in Belgium [*R.A.M.*, xvi, p. 649] and elsewhere in plants weakened by virus yellows [see preceding and next abstracts] or magnesium deficiency. In the tests at Wageningen, Holland, here described *Phoma betae* [ibid., xviii, p. 79] was found to be a much more virulent parasite, capable of producing typical brown patches on the green leaves of healthy plants. Black spot disease thus assumes two forms, the primary due to direct infection by *P. betae*, and the much more common secondary associated with *A.* sp.

DECOUX (L.) & SIMON (M.). **La jaunisse de la Betterave et les propriétés physiques du sol.** [Beet virus yellows and the physical properties of the soil.]—*Publ. Inst. belge Amélior. Better.*, vii, 4, pp. 223–237, 1939. [Dutch, German, and English summaries.]

A tabulated account is given of recent pedological studies on soil samples from the principal Belgian beet-growing districts, viz., Hesbaye, Hainault, Flanders, and Brabant, the analytical data from which revealed no correlation between the physical properties of the soils in question and the incidence of virus yellows [see preceding and next abstracts].

DECOUX (L.), VANDERWAEREN (J.), & ROLAND (G.). **La végétation de la Betterave en Belgique au cours de l'année 1938.** [The development of the Beetroot in Belgium during the year 1938.]—*Publ. Inst. belge Amélior Better.*, vii, 4, pp. 293–317, 1939. [Dutch, German, and English summaries.]

The following items of phytopathological interest occur in this report

[cf. *R.A.M.*, xviii, p. 78]. The loss in the Belgian sugar beet crop from virus yellows [see preceding abstracts] is estimated at fr. 46,422,700 as against fr. 30,031,000 in 1936, while the addition to the former sum of the fodder beet failures from the same cause would bring it to a total of over fr. 60,000,000.

Heavy damage was also caused by *Rhizoctonia violacea* [*Helicobasidium purpureum*: ibid., xviii, p. 76], the first effect of which is to lower the sugar content of the roots and ultimately to reduce their weight.

Mildew (? *Microsphaera betae*) [ibid., xiv, p. 548] was observed in the conidial stage on sugar beets at Alveringhem, this being the first record of the disease for Belgium. The conidia measured 35 to 45 by 12·5 to 18·7 (average 40 by 14·4) μ.

LEWIS (A. H.). **Manganese deficiencies in crops. I. Spraying Pea crops with solutions of manganese salts to eliminate marsh spot.**—*Emp. J. exp. Agric.*, vii, 26, pp. 150–154, 1939.

A tabulated account is given of experiments at three centres in the Romney Marsh (Kent) area in the control of marsh spot of peas [*R.A.M.*, xviii, p. 777] by the soluble manganous chloride, applied either to the soil at rates of 10 to 500 lb. per acre, or as a spray at rates of 5 to 20 lb. per acre, the spray being supplemented by 0·1 per cent. by weight of a wetting agent, lissapol L. Heavy dressings applied to the soil at sowing time had very little effect on the disease, but applications made when the plants were in flower were more effective. The best results, however, were obtained by spraying the plants at flowering with 5 to 10 lb. of the compound per acre, which at the latter rate reduced the incidence of the disease from 65·3 and 47·5 to 4·5 and 6 per cent. at two of the centres. On the basis of these results the author tentatively recommends spraying once at flowering with 24 lb. anhydrous manganous sulphate (or 36 lb. hydrated) in 100 gals. water plus 1 lb. lissapol L, or spraying twice at flowering with the amount of sulphate reduced to 12 (or 18) lb. Some evidence of increased yield from the manganese treatments (irrespective of the date of application) was obtained, but this aspect of the problem demands further study.

WALLACE (G. B.). **French Bean diseases and Bean fly in East Africa.**—*E. Afr. agric. J.*, v, 3, pp. 170–175, 1939.

During the past year, French beans (*Phaseolus vulgaris*) in the Tanga and Northern Provinces of Tanganyika Territory have made poor growth and given reduced yields as a result of attack by a number of diseases, including halo blight (*Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*) [*R.A.M.*, xviii, p. 495], rust (*Uromyces appendiculatus*) [ibid., xix, p. 59], common mosaic [ibid., xviii, p. 648], anthracnose (*Colletotrichum lindemuthianum*) [ibid., xvii, p. 716], and yeast spot (*Nematospora coryli*) [cf. ibid., xi, p. 698].

In a dry year, such as 1938, only the leaves, and to a less extent the seeds, of French bean plants show recognizable symptoms of halo blight. In 1938, the commonest leaf symptom consisted in large, dry, brittle, brown areas at the tip or near the margins, and bordered by a wide, pale yellow zone. Many leaves presented small, pale areas

bounded by darker green parts lying along the veins, this symptom somewhat resembling mosaic. Affected seeds show raised yellow or orange blisters, and when badly diseased may be small and completely coloured and blistered.

Pending the development of resistant varieties the following control measures are recommended in localities where susceptible crops are grown and the disease is endemic. Seed should be obtained from a healthy crop and sown in ground in which no susceptible species has been grown for at least three years; it should not be previously soaked. If seed is to be taken from the planter's own crop, seed should be sown singly and at wide intervals on a small plot away from the main crop, and affected plants rogued out, only the healthy seed being retained. When infection is severe, fallen leaves and old vines should be promptly burnt. If these methods fail, a resistant legume should be grown, such as soy-bean, adzuki bean [*Phaseolus angularis*], bonavist bean, broad bean, gram [*Cicer arietinum*], cowpea, or field peas; kudzu vine [*Pueraria thunbergiana*], white sweet clover [*Melilotus alba*], and lucerne are also resistant.

Rust is widespread in Tanganyika, where it is probably the bean disease best known to planters; anthracnose is not severe locally. Yeast spot is widespread, but varies in intensity.

CHORIN (M.). **The chocolate spot disease of Beans.**—*Palest. J. Bot.*, R Ser., ii, 2, pp. 291–293, 1 fig., 1939.

The chocolate spot disease (*Botrytis fabae*) was observed on broad beans [*R.A.M.*, xvii, pp. 646, 767] in Palestine at the end of 1938. Previous occurrences of the fungus in the country in 1925–6 and 1935–6 were not accurately diagnosed. The spores of the Palestine strain measured 17·5 to 28 by 9 to 14 μ and thus slightly exceeded in length those of the Spanish [ibid., ix, p. 424] and Cyprus [ibid., xiv, p. 734] specimens; a comparative study of the various strains concerned in the etiology of the disease would be necessary to establish the exact identity of each. Ecologically the fungus is regarded as oceanic in character and thrives only where temperatures are [comparatively] low (the optimum for infection according to Wilson [ibid., xvi, p. 723] being 20° C.) and atmospheric humidities are high.

VAN POETEREN (N.). **Onderzoek over het koprot in de Uien van de oogst 1938.** [An investigation on neck rot in Onions of the 1938 harvest.] —*Versl. PlZiekt. Dienst Wageningen* 90, 2 pl., 1939.

Of 99 pure cultures from 48 onions affected by neck rot, which was responsible for losses of 30 to 50 per cent. or more in the 1938 harvest in several parts of Holland, 69 yielded *Botrytis allii*, and two each *B. byssoidea* and *B. cinerea*, the first-named also developing in 16 cultures from 11 onions with soil rot, characterized by symptoms resembling those of neck rot but originating in the scales. *B. squamosa* was subsequently isolated from the dead leaves of potted onion plants, but its causal connexion, if any, with the decay could not be determined [*R.A.M.*, vi, p. 267; xviii, pp. 430, 431, 726]. Outstanding American contributions to the study of neck rot are summarized.

From an analysis of the meteorological data for the three years in

which the disease has been recorded in a serious form in Holland, viz., 1928, 1929, and 1938, the writer concludes that *B. allii* is favoured by relatively dry conditions. The Dutch mean summer temperatures (16·5°, 18·3°, 17·8°, and 15° C. for June, July, August, and September, respectively), fall within the limits of 15° to 20° defined in the United States as the optimum for the development of the fungus. From the replies to a questionnaire obtained from 26 growers owning 39 fields the following tentative conclusions are drawn. The disease would appear to occur indiscriminately on light and heavy soils, its incidence not being appreciably modified either by the choice of fertilizer or by the foregoing crop in the rotational sequence. Generally speaking, late (April), sowings tended to produce more diseased plants than earlier ones, and there were distinct indications of a correlation between rank growth and liability to infection.

SCHULTZ (H.). **Blattschäden an Spinat durch Colletotrichum spinaciae Ell. et Halst.** [Damage to Spinach leaves from *Colletotrichum spinaciae* Ell. & Halst.]—*Zbl. Bakt.*, Abt. 2, ci, 9–13, pp. 225–232, 7 figs., 1939.

In the course of investigations at the Grossbeeren (Kreis Teltow) branch of the Biological Institute, on the reaction of vegetables to diseases, observations were made on the infection of El De Es spinach by *Colletotrichum spinaciae* [*R.A.M.*, xviii, p. 572], apparently not previously reported from Germany. The examination of diseased foliage revealed complete disorganization of the tissues, which were densely permeated by the inter- and intracellular hyphae. Above and below the lesions is formed the depressed, later erumpent acervulus, sparsely encircled by thick-walled, brown, mostly pluriseptate setae, 54 to 117 (average 80·6) μ, and giving rise to hyaline, cylindrical, closely aggregated conidiophores from which are abstricted oblong, unicellular, slightly falcate conidia of very variable dimensions, those from naturally infected leaves ranging from 20·7 to 27·6 by 3·6 to 5·4 μ, from the moist chamber 23·4 to 39·6 by 2·7 to 4·5 μ, and in culture from 13·5 to 29·9 by 2·4 to 5·2 μ. On the basis of these data, Ellis and Halsted's diagnosis of *C. spinaciae* is emended in respect of conidial dimensions to 13 to 30 by 2·5 to 4·5 μ, and of those of the setae to those given above. Chlamydospores were produced in pure culture by some of the mycelial cells developing a thick membrane.

In the field the leaf blight spread from El De Es to all the other varieties under cultivation, namely, Berlin Markthallen, Brunswick Giant, Juliana, King of Denmark, Matador, Scharfsamiger, Universal, and Victoria. Inoculation experiments in the greenhouse with a conidial suspension of the fungus resulted in heavy damage, mostly followed by death, on the El De Es, Gaudry, King of Denmark, Long-leaved Winter, Matador, and Improved Green Thick-leaved varieties. Friedrichswerth beets reacted similarly to spinach, but the symptoms were milder and the fructification of the pathogen less intense, while Erstling [Duke of York] potatoes were so slightly attacked that there is considered to be no risk of infection under natural outdoor conditions.

The fungus is perpetuated by means of the seed, Dutch El De Es samples of which were covered with acervuli and gave rise in sterile

soil under a bell-jar to severely infected plants. In the field dissemination is effected by the conidia which are formed in profusion.

FIKRY (A.). **Water-table effects. IV. Relative incidence of diseases on Cucurbits.**—*Bull. Minist. Agric. Egypt* 221, 9 pp., 13 pl., 6 graphs, 1939.

In further studies on the effect of varying heights of the subsoil water table on the incidence of crop diseases [*R.A.M.*, xvi, p. 755], the author conducted field experiments at Delta Barrage, Egypt, in 1935 and 1937 with Iskandarani vegetable marrow and Chilian Black Seeded watermelon, naturally infected with mildew (*Erysiphe cichoracearum*) [ibid., xiii, p. 216] and leaf spot (*Colletotrichum lagenarium*) [ibid., xvii, p. 789], respectively. The experimental plots were situated on three terraces, the low one about 35 cm. lower than the medium and the medium about 65 cm. lower than the high. The average height of the subsoil water table from August to October, 1937, was from 10 to 85 cm. in the low and from 105 to 185 cm. in the high terrace. The results show that both diseases appeared earlier, developed more rapidly, and were more severe in low plots than in high ones, the plants being consequently less vigorous and the yields poorer in the former. Thus, of the vegetable marrow plants 100, 80, and 65 per cent. were diseased in the low, medium, and high plots, respectively, the corresponding figures for watermelons being 100, 64, and 21 per cent., respectively, and while a high percentage of plants were killed by the diseases in the low terrace, none perished in the higher ones. During the period of maximum water-table height in September and October, the crop obtained from the high terrace of two plots was, respectively, 8 and 17 times greater in the number of fruits and 13 and 20 times greater in weight than in the low one.

The physiological wilting of watermelon plants sown by the Baili method (comprising the setting of germinated seeds in soil wetted by high subsoil water in January and February) observed in various districts, was proved in experiments at Salhia to be directly caused by high water-table level. Secondary organisms, mainly a species of *Fusarium*, invade the rotted roots of the wilted plants after a time.

DOOLITTLE (S. P.), BEECHER (F. S.), & PORTE (W. S.). **A hybrid Cucumber resistant to bacterial wilt.**—*Phytopathology*, xxix, 11, pp. 996–998, 1 fig., 1939.

Promising results have been obtained at the Beltsville (Maryland) Horticultural Station in the development of a cucumber resistant to wilt (*B[acillus] tracheiphilus*) [*Erwinia tracheiphila*: *R.A.M.*, xix, p. 65] by crossing Tokio Long Green with Vickery Forcing, the offspring of which (both entirely selfed and partially open-pollinated) contracted only 18 to 32 per cent. infection in 1938 compared with 74 per cent. in White Spine and 100 in certain foreign varieties.

BOTTOMLEY (A[VERIL] M.). **Intensive Mushroom-growing for the amateur. III. Pests and diseases.**—*Fmg S. Afr.*, xiv, 164, pp. 443–447, 6 figs., 1939.

The author states that, so far as is known, the only fungal diseases

of importance that affect cultivated mushrooms [*Psalliota* spp.] in South Africa are that due to *Verticillium* sp., and white plaster mould (*Monilia* [*Oospora*] *fimicola*) [*R.A.M.*, xviii, p. 88]. The former is favoured by humidities over 95 per cent., temperatures over 65° F., poor ventilation, and the presence of trash on the beds and floor. Control measures consist in regulating humidity, temperature, and ventilation, immediately destroying infected mushrooms, and spraying the affected parts of the beds after the removal of the affected mushrooms with Bordeaux mixture (2–2–50). As a last resort, the casing soil can be removed and the beds recased. To remove the disease from a house all the woodwork should be gone over with a blow-lamp after harvesting, and the premises disinfected with 2 per cent. formalin [cf. ibid., xix, p. 63]; prevention depends on maintaining the peak heat of the compost at 130° for 12 hours.

The principal causes leading to attack by *O. fimicola* are improperly fermented manure and chilling of the beds; contributing factors are excessive moisture and inadequate ventilation. The only control method known is to remove the affected casing soil or compost and that round it. Under South African conditions, growers might replace it with sterilized soil moistened with dilute acetic acid, or sterilize the edges of the remaining compost and casing with 2 per cent. formalin. To prevent further attacks the shelves should also be sterilized with formalin and flamed with a blow-lamp after each crop.

The paper concludes with a list of recommendations on the care and upkeep of mushroom beds.

WATANABE (T.). **Studies on the physiologic specialization in Fusarium sp. causing the stem rot of Sweet Potatoes. III. Toxicity of the cultural filtrate. IV. Pathogenicity. V. Morphology and taxonomy of the causal fungus. VI. Conclusion.**—*Bull. Utsunomiya agric. Coll.*, Sect. A., ii, 7, pp. 263–321, 1939. [Japanese, with English summary.]

Forty strains of the species of *Fusarium* responsible for stem rot of sweet potatoes in Japan [*R.A.M.*, xviii, p. 496] were grown for a month at room temperature on a quintuple Richards's solution and observed for cultural and pathogenic evidence of physiologic specialization. Tests of the toxic effect of the cultural filtrates on stem cuttings of the host resulted in the tentative classification of the strains under review in three growth types.

In inoculation tests on seedlings of 13 varieties the lowest percentages of infection (20 to 25 per cent.) were obtained with strains 7, 11, 31, and 4, and the highest (45 to 50) with 2, 30, 32, 14, and 24, the remainder producing intermediate effects. The most resistant variety was Taihaku, with 13·8 per cent. infection, followed by Kintoki and Oiran, and the most susceptible Jiugonichi (59·3), with Kawagoe-Beniaka and Akaimo next in order. The length of the fissures induced by the various strains on the host stems was closely correlated with the incidence of infection. The strains under observation fell into six types on the basis of their pathogenicity relationships.

Taxonomic studies of the isolates on 2 per cent. potato dextrose agar at 30° C. revealed only slight differences in the length and breadth of

the microconidia and the width of the macroconidia, but the length of the latter varied appreciably. On the basis of this character, therefore, the strains are classified as follows: 14 (including Nos. 14, 24, and 32) are referred to *F. bulbigenum* var. *batatas*; 25 (including Nos. 4, 7, 11, 30, and 31) to *F. oxysporum* f. 2; and one (strain 2, the most highly pathogenic of all) to *F. semitectum* var. *majus* [ibid., xvii, pp. 154, 161, *et passim*].

LIHNELL (D.). **Några iakttagelser rörande sjukdomar på Soja i vårt land.** [Some observations concerning Soy-Bean diseases in our country.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1939*, 4–5, pp. 69–73, 5 figs., 1939.

Soy-beans, a new experimental crop in Sweden, are subject to the following diseases: bacteriosis (*Pseudomonas* [*Bacterium*] *sojae*) [*R.A.M.*, xvi, p. 585], *Peronospora* [? *manschurica*: ibid., xv, pp. 198, 632], *Sclerotinia sclerotiorum* [ibid., xi, p. 87, 316], and various forms of mosaic [ibid., xviii, p. 608], including that referred to in the literature as 'soy-bean virus 1'.

KOVAČEVSKI (I. C.). **Die Blattfleckenkrankheit der Paprika in Franz. Marocco.** [The Chilli leaf spot disease in French Morocco.]—*Z. PflKrankh.*, xlix, 10–11, p. 567, 1939.

The chilli leaf spot disease attributed by G. Berger in French Morocco to *Cercospora capsici* Heald & Wolf [*R.A.M.*, xvii, p. 507,] is considered from the accompanying figure to be undoubtedly due to *Cladosporium capsici* (March. & Stey.) Kovač., fully described from Bulgaria [ibid., xvii, p. 791]. Other countries in which the fungus occurs include Spain, the Belgian Congo, and the Azores.

The Plants Protection Ordinance (Kenya), 1937. Government Notices Nos. 851 (1938) and 468 (1939).—2 pp., 1939. [Mimeographed.]

Government Notice No. 851 of 21st November, 1938, adds barberry and buckthorn [*Rhamnus* (?) *cathartica*] to the list of seeds the importation of which into Kenya is allowed by Government Notice No. 688 of 2nd September, 1937, only under permit [*R.A.M.*, xvii, p. 208], while potatoes are added to the schedule by Government Notice No. 468 of 19th June, 1939.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. List of intercepted plant pests, 1938.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 62 pp., 1939.

Lists are given of pests and diseases intercepted on plants or plant products entering the United States during the period 1st July, 1937, to 30th June, 1938 [cf. *R.A.M.*, xvi, p. 784]. Attention is drawn to the serious quarantine problem presented by the destructive virus diseases, which cannot be detected in most types of material submitted to inspection, and in any case could not be specifically determined: a case in point is the heavy damage reported as due to viruses on imported lily bulbs [ibid., x, p. 461].

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GONÇALVES DA SILVA (S.). **A ferrugem do Pimentão.** [Chilli rust.]—*Biologico*, v, 11, pp. 253–254, 1939.

A semi-popular note is given on the rust of chillies (*Capsicum* spp.) in São Paulo and other parts of Brazil due to *Puccinia paulensis* [*R.A.M.*, xvii, p. 17], which forms its rust-coloured pustules on the leaves and branches, both the upper and under surfaces being involved in severe cases, as well as the petioles, peduncles of the fruits, and even the floral buds. In addition to cultural measures of control, including bi- to triennial crop rotation, the writer recommends fortnightly treatments of the plants with 1 per cent. Bordeaux mixture.

BAUDIN (J.). **Chronique. Traitements contre la chlorose. Traitement de l'excoriose.** [Current notes. Treatments against chlorosis. Treatment of excoriosis.]—*Progr. agric. vitic.*, cxii, 44, pp. 320–321, 1939.

To be effective, the treatment of vine chlorosis by swabbing the pruned stocks with iron sulphate [*R.A.M.*, xviii, p. 435] must be carried out immediately after pruning, in order that the chemical may be absorbed by the vine.

Excoriosis [*Phoma flaccida*: ibid., xvii, p. 372] is becoming increasingly prevalent in France. Control measures should be carried out in autumn, and should consist in pruning, followed by the immediate removal of the prunings, and spraying the branches and shoots (not the pruning wounds) with iron sulphate (30 to 35 per cent. solution, preferably with the addition of sulphuric acid at the rate of 1 in 100 by volume). A second spray treatment may sometimes be necessary; this should consist in an application of iron sulphate before vegetation starts or of an ordinary cupric mixture (3 or 4 per cent.) when vegetation begins.

BENNETT (F. T.). **Some past and present crop disease problems in the north of England.**—*Ann. appl. Biol.*, xxvi, 4, pp. 837–841, 1939.

Surveying the crop disease situation in the north of England the author states that control of club root of swedes (*Plasmodiophora brassicae*) [*R.A.M.*, xvi, p. 222; xvii, p. 283] by lime is adopted as a standard practice everywhere. On notoriously sour soils, however, this treatment is not economical. Attempts to find a variety of swedes resistant on badly contaminated marshy land in a wet season were unsuccessful, but under less severe conditions the varieties Bangholm and Wilhelmsburgher proved markedly resistant.

Dry rot of swedes (*Phoma lingam*) [ibid., xviii, p. 222], arising from a combination of infected seed and contaminated dung, has been so widespread and severe that some farms with short rotations had to abandon the crop on its account. When seed from two stocks of the same variety were grown alongside each other on a field which was not contaminated, one stock gave 60 and the other 1 per cent. of diseased roots, illustrating the possibility of losses from infected seed.

Boron-deficient soils do not occur uniformly in Cumberland, so that routine treatment against brown heart of swedes [ibid., xviii, p. 565] cannot be recommended. The condition is controlled by borax or boronated basic slag, at a cost of from 2*s*. 6*d*. to 3*s*. 6*d*. per acre, and by boronite at 11*s*. per acre.

A chlorotic condition of *Brassica* spp. resembling mosaic, but not, according to K. M. Smith, of virus nature, is stated to cause the dying-off of winter and spring greens under frost, and stunted heads in cauliflower and broccoli.

A form of grey leaf of oats [also known as grey speck: ibid., xix, p. 6] is reported to occur frequently in Cumberland on land suffering from colliery damage. Dressings of manganese sulphate often fail to control the trouble, and it is assumed that other factors are involved. The relative freedom from *Ophiobolus graminis* in the north is attributed to the combination of more or less acid soil, successively lower susceptibility of the kinds of cereals grown in succession, and green manuring by long leys.

Spraying against potato blight (*Phytophthora infestans*) is stated to be applied to a small extent only, as growers think it more economical to risk an occasional bad season than to spray every year. Seed potatoes are now grown in the Eden valley where soil and climate are specially suitable; they compare most favourably every year with the best of seed from elsewhere.

Perfect control of leek blight (*P. porri*) [ibid., xi, p. 151] is obtained by spraying with Bordeaux mixture.

Outstanding among the diseases of tomato is a root rot associated with a species of *Colletotrichum*.

Van Poeteren (N.). **Verslag over de werkzaamheden van den plantenziektenkundigen Dienst in het jaar 1938.** [Report on the work of the Phytopathological Service in the year 1938.]—*Versl. PlZiekt. Dienst Wageningen* 93, 92 pp., 11 figs., 1939.

The following are among the items of interest in this report, compiled on the usual lines [*R.A.M.*, xviii, p. 153]. The year 1938 was characterized by an exceptionally severe epidemic of yellow rust (*Puccinia glumarum*) of wheat, the Joncquois variety being particularly susceptible.

The beet crops sustained heavy and widespread damage from *Rhizoctonia violacea* [*Helicobasidium purpureum*: see below, p. 251], which can only be combated on a large scale by prophylactic cultural measures, notably a judicious crop rotation excluding from the immediate sequence not only beets but also such other hosts of the fungus as carrots, cabbages, rape [*Brassica napus* var. *oleifera*], clover, and lucerne.

Blue spotting of potatoes [ibid., vi, p. 632; xv, p. 526], which appears to be more prevalent than generally supposed, may easily be prevented by liberal applications of potash. 'Glassiness' [cf. ibid., xvi, p. 118] or 'iciness' of cut surfaces, a disorder of obscure origin presumably associated with adverse climatic conditions, caused heavy losses, a number of the affected crops being unsaleable. Eersteling [Duke of York] tubers with sunken, bluish patches round the 'eyes' gave rise to plants showing all the typical symptoms of stipple streak [ibid., xvi, p. 552], including the well-known brown spots surrounding the 'eyes'.

A species of *Fusarium* was isolated from reddish, sunken lesions on freesia bulbs [ibid., xiii, p. 101], the discoloration in some cases extending far into the tissues. Diseased bulbs were either a complete failure or produced sickly plants which soon turned yellow and died. For some years freesias have also suffered from a physiological disease which was particularly severe in 1938. The bulbs of affected plants appear quite sound, but above the root-collar a long, brown lesion develops, softening the tissues and causing collapse of the leaflets; no flowers are produced. The disturbance is tentatively ascribed to defective cultivation, and suggestions are made for remedying the trouble by improvements in the environmental conditions of the plants. Freesias, especially the coloured hybrid varieties raised from bulbs, are also liable to severe mosaic infection, Buttercup, Apotheosis, and Wistaria being specially susceptible. *Colchicum* smut [*Urocystis colchici*: ibid., xvi, p. 837] was unusually prevalent in 1938, *C. bornmülleri*, *C. autumnale*, and Lilac Wonder suffering particularly severe injury. The dark-coloured spores are ordinarily confined to the leathery exterior of the bulb and the outer surface of the inner white tissues, but on occasion they may penetrate deeply inwards. During growth the leaves may be covered with the spores, arranged in longitudinal rows and sometimes extending right down to the bulb. Among the more promising of the various substances tested for the control of tulip blight (*Botrytis tulipae*) [ibid., xviii, pp. 30, 129, 712, 726] were shirlan A.G. (1·2 and 0·6 per cent.), tulisan (1, 0·8, and 0·5 per cent.), and Wacker's kupferkalk [ibid., xvi, p. 230].

Some of the teleutospores of rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xviii, p. 184] on leaves from Aalsmeer failed to develop owing to infection by an undetermined species of *Fusarium*, a phenomenon not previously observed in Holland.

Armillaria mellea was very troublesome during 1938, not only on privet [ibid., xvi, p. 215], a very susceptible host, but also on oaks [loc. cit.], beeches [ibid., x, p. 698], and conifers. The spread of the fungus from neglected woods to cultivated plantings is effected by spores as well as by rhizomorphs, the former having been responsible for the infection of a 24-year-old Virginia creeper at Wageningen.

Notes are given on the potato blight (*Phytophthora*) [*infestans*] spray warning service [ibid., xiv, p. 13] and the testing of various fungicides.

Pole Evans (I. B.). **Annual Report of the Division of Plant Industry for the year ended 31st August, 1939.**—*Fmg S. Afr.*, xiv, 165, pp. 520–540, 16 figs., 1939.

The section of this report dealing with plant pathology (pp. 539–549)

in South Africa [cf. *R.A.M.*, xviii, p. 437] contains, among others, the following items of phytopathological interest. No citrus canker [*Pseudomonas citri*: loc. cit.] has been recorded in the Union for nine years, and all restrictions on the planting of citrus in areas hitherto quarantined have now been removed. Studies on citrus dry root rot [cf. ibid., xiii, p. 356] indicated that in well-drained, aerated soil, over-irrigation does not increase incidence if the soil fertility is maintained, but that if soil fertility is not maintained over-irrigation may induce chlorosis, severe defoliation, and die-back.

Evidence was obtained that groundnut leaf spot in the northern Transvaal is due to only one species of *Cercospora*, viz., *C. personata* [ibid., xvii, p. 442]. In some parts of the northern Transvaal rotting of groundnut stems, nuts, and peduncles was very prevalent, causing 5 to 70 per cent. loss in individual crops. Extensive isolations from all affected parts of plants from various localities invariably gave *Sclerotium rolfsii* [loc. cit.; ibid., xviii, p. 788]. In South Africa the disease never attacks the roots. In several groundnut crops the kernels failed to develop, or only partially developed; no one organism appeared to be constantly associated with the condition, but soil saprophytes such as *Rhizopus nigricans*, *Aspergillus niger*, and *Penicillium glaucum* were present in affected material, and the trouble was attributed to unfavourable climatic or soil conditions.

The *Pestalozzia* associated with the ripe rot of litchi [*Nephelium litchi*] fruits [ibid., xviii, p. 438] was isolated from fruits in all stages of growth, indicating that some infection, at least, occurs during or just after flowering. As one-year-old, dried-out cultures of the *Pestalozzia* were easily revived by transferring spores to fresh media, the fungus appears to be highly resistant to desiccation and other unfavourable conditions.

Pineapple fruits in eastern Cape Province were affected by typical black spot due to *Penicillium* spp., a wedge-shaped black spot not previously studied and due possibly to a mixture of *Penicillium* and *Fusarium*, and by a soft, light brown, somewhat translucent spotting due to *Fusarium* sp.

Tomato losses due to *F.* [*bulbigenum* var.] *lycopersici* [ibid., xvi, p. 367; xviii, p. 788] remain considerable. Preliminary pot tests and one field experiment indicated that soil treatment with calcium cyanamide was of marked value in control and also promoted excellent growth.

Investigations into a black spot of papaw apparently new to South Africa indicated that it is probably the same as the disease reported by Hopkins from Southern Rhodesia as due to *Phoma caricina* [ibid., xvii, p. 611].

Tobacco leaf curl [ibid., xvi, p. 367] caused heavy losses in certain localities, some growers neglecting to remove old stumps after picking, though if this precaution is taken the disease can be practically eliminated. Legislation providing a close season for tobacco is very desirable [cf. next abstract]. On some land, tobacco 'kromnek' [cf. ibid., xv, pp. 425, 687; xvii, p. 442] caused serious losses, but several growers who put into practice the official recommendations reported a considerable reduction in the disease.

Of a total of 311,231 citrus trees examined, 48 were affected by scaly

bark [psorosis: ibid., xix, p. 86], of which 31 were in the Rustenburg area. Growers were notified that they must destroy affected trees.

New records included sugar-cane rust (probably *Puccinia kuehnii*) [ibid., xviii, p. 626], gladiolus smut [*Urocystis gladioli*: ibid., xviii, pp. 33, 139], phlox leaf spot (*Septoria drummondii*) [ibid., xvii, p. 374], and internal dry rot of granadilla fruits [*Passiflora edulis*] caused by *Fusarium oxysporum.*

HOPKINS (J. C. F.). **Recent advances in plant pathology in Southern Rhodesia.**—*Proc. Rhod. sci. Ass.*, xxxvii, pp. 25–28, 1939.

In this review of recent advances in plant pathology in Southern Rhodesia with special reference to disease control, the author, after dealing with the control of tobacco diseases by spraying both in the seed-bed and the field [*R.A.M.*, xviii, p. 483], states that leaf curl [ibid., xviii, p. 632], has now become of minor importance as a result of legislation enforcing a close season in which no tobacco is allowed to grow and the infected white flies [*Bemisia* sp.] die off before the new crop is sown.

Most of the breakdown among apples in local storage was found to be due to canker (*Botryosphaeria ribis chromogena*) [ibid., xviii, p. 784], infection being set up by spores discharged from diseased parts of the trees. The disease was almost eliminated from affected orchards by the excision and destruction of the cankered bark and branches. Fruit trees at Rusapi apparently dying owing to attack by little leaf [ibid., xviii, pp. 187, 261] were stimulated to new growth by applications of sprays containing zinc sulphate.

Except in winter, it is almost impossible to grow the best marrowfat peas locally, owing to infection by mildew [*Erysiphe polygoni*: ibid., viii, p. 485], but selection of resistant types has yielded several promising strains. Damping-off of various plants has been virtually eliminated by sprinkling the soil with Bordeaux powder after sowing and foot rots of transplants may be similarly prevented by sprinkling dust round each stem.

Report of the Waite Research Institute, Glen Osmond, South Australia, 1937–1938.—x + 120 pp., 3 pl., 2 figs., 5 graphs, 1 map, 1939.

In the section of this report [cf. *R.A.M.*, xvi, p. 516] dealing with plant-pathological work in South Australia (pp. 35–40) it is stated that during the period under review tomatoes were reported for the first time locally to be attacked by *Aplanobacter michiganense* [ibid., xviii, pp. 279, 765]. *Botryosphaeria dothidea* [ibid., xii, p. 447] is recorded causing a scab on briar rose canes, and *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: ibid., xvii, p. 600] produced a canker at the point of budding on roses. *Boronia spinescens* was attacked by rust (*Puccinia boroniae*) [ibid., xii, p. 97]. During the last three years, celery pink rot (*Sclerotinia sclerotiorum*) [ibid., xviii, p. 789] has become increasingly prevalent, partly owing to unsatisfactory disposal of infected debris and partly owing to the short rotational system practised locally. Cauliflower leaf spot (*Cylindrosporium concentricum*) [ibid., xviii, p. 654] was observed for the first time; discoloured patches were produced on the curd, reducing the market value of the affected plants. *Stereum sanguinolentum* [ibid., xviii, pp. 361, 559, 564] was common

on the forest floor and was found on standing diseased *Pinus radiata* in a forest plantation. *Ophiobolus graminis* [ibid., xviii, p. 656], *Rhizoctonia* [*Corticium*] *solani*, *Fusarium* spp., and *Helminthosporium sativum* were present, separately and together, on wheat affected by root disease, the evidence indicating that *O. graminis* is of particular importance in this connexion. Old-established vines of wine-variety grapes near Adelaide are affected by a condition resembling court-noué [ibid., xvii, p. 96]. The symptoms become most conspicuous in spring, and are usually confined to the shoots of one arm. The affected shoots are greatly shortened and the leaves dwarfed and, frequently, mottled and necrotic. Severely affected shoots often die, though others appear to recover.

Field work on the effects of copper deficiency on wheat (p. 55 of the report) [ibid., xvii, p. 508; xviii, p. 546] showed that the increased yield resulting from copper applications was due to increase in the number of heads per plant and grains per head and to increase in the average weight of individual grains. Oats dressed with copper sulphate showed increase in the number of panicles per plant and grains per panicle, and excessive tillering was overcome. In both crops treatment with copper gave an increase in the percentage of head or panicle bearing tillers and in the grain/straw ratio.

In studies on the chemistry of plant viruses (pp. 58–60) the tobacco mosaic virus was found to behave like a typical colloidal solution of negatively charged protein particles. The higher the valency, the greater was the precipitating power of cations. The effect of anions on the precipitating power was so marked that they were readily placed in a series that agreed well in principle with the Hofmeister or lyotropic series for other colloids. The metallic ions of higher valency formed insoluble compounds with the virus, but the salts of monovalent cations almost always formed paracrystalline needle fibres, easily dispersed to submicroscopic dimensions by agitation or dilution.

The White Beauty tomato variety was found to have approximately the same degree of susceptibility to spotted wilt as Early Dwarf Red; White Stem Orinoco, Kelly, and Blue Pryor tobacco plants grown at the Waite Institute showed 80 to 100 per cent. natural infection by spotted wilt.

LITTLEJOHN (L.). **Annual Report of the Botanist and Plant Pathologist for the year 1938.**—Reprinted from *Rep. Dir. Agric. Cyprus, 1938*, 4 pp., [1939].

This report [cf. *R.A.M.*, xviii, p. 90] contains the following items of interest, apart from those already noticed from other sources [cf. ibid., xvii, p. 787]. Potatoes were commonly attacked by *Macrophomina phaseoli* [ibid., xvii, p. 552], which caused much tuber rot in the field. In a further seed potato disinfection experiment carried out in co-operation with A. E. Muskett on the same lines as in 1937 disinfection with 0·5 per cent. aretan [ibid., xviii, p. 544] in Northern Ireland considerably reduced wastage by common and powdery scab (*Actinomyces scabies* and *Spongospora subterranea*, respectively), during transit. When the crop was lifted no powdery scab was found, the fungus, apparently, not being viable under the conditions prevailing in Cyprus. Taking the results as a whole, disinfection before or after transit reduced

the amount of common scab in the crop from over 20 per cent. to under 1, and increased the yield by 13 per cent., this increase apparently being due to the fact that more plants from the treated than the untreated seed reached maturity. Rotting in transit was inversely proportional to yield. Reduction in yield would, therefore, appear to have been due partly to rotting in the ground after planting, a process which disinfection partly prevents. The amount of scab in the crop again bore no relation to the amount of scab in the seed.

Orange mottle leaf [ibid., xviii, p. 91] was very common in some localities, particularly near Famagusta, little leaf [ibid., xvi, p. 94] and xyloporosis [ibid., xviii, p. 101] also being prevalent in some gardens. Oranges subjected to the following treatments: (1) wilted in a clean packing shed, (2) in a contaminated packing shed, (3), (4), and (5) dipped in 1, 0·5, or 0·25 per cent. shirlan, and (6) stem-end dipped in sulphur just before wrapping, were wrapped and boxed on 9th March at Famagusta and transported to Nicosia; when opened on 1st April they showed, respectively, 1·01, 17·28, 11·63, 11·09, 32·09, and 32·08 per cent. wastage [cause unspecified]. These results clearly show that fruit infection occurs chiefly in the packing shed; shirlan at the two higher concentrations appears to have given some control, the increased rotting in the other treatments probably resulting from the increased handling involved.

Rosellinia necatrix [ibid., xviii, p. 90] attacked seedling almonds and other fruit trees in a nursery, which was closed to prevent spread. The fungus was also found in several other localities on fruit trees, especially peach, apple, cherry, and almond.

Division of Plant Pathology.—*Rep. N.Y. St. agric. Exp. Sta., 1938–39*, pp. 23–28, 1939.

In this report [cf. *R.A.M.*, xviii, p. 236] on plant disease work in New York State in 1938–9 it is stated that wet wettable sulphurs (in paste form) were more effective against apple scab (*Venturia inaequalis*) than the same material used dry. Bordeaux mixture caused less injury when containing six times as much lime as copper sulphate than when it contained only twice as much. Bordeaux mixture 1½–9–100, or an insoluble copper with 2 lb. lime for each ¼ lb. actual copper with a residue builder, must be used in the first cover spray if oil sprays are to be used in later covers.

Abundant fruit and foliage infection was obtained with *Gymnosporangium* [*juniperi-*]*virginianae* [ibid., xix, p. 28] in five hours; foliage infection may occur within three hours of wetting after the sporidia are placed on the leaves. Infection may be obtained at 8° to 10° C., and the fruit is susceptible at any time after the fruit cluster has opened. Sporidia may remain viable on the foliage for about 24 hours. Lime-sulphur is effective eight hours after the sporidia are *in situ*, but after four hours wettable sulphurs cease to be toxic.

Against cherry leaf spot (*Coccomyces hiemalis*) [ibid., xviii, p. 785] wettable sulphurs with a residue builder were more effective than liquid lime-sulphur, while copper materials were much safer than these. Lime should be added to all insoluble coppers used against this fungus, in amounts equal to 1 lb. to each ¼ lb. metallic copper. Cupro-K is the

only copper material that can be used without lime in a non-residue programme, and even this material would probably cause yellowing. The addition of lime reduces control, and a residue builder should be added when possible. Cuprocide ($\frac{1}{4}$ to $\frac{1}{2}$ per 100) with a good spreader, such as igepon, is the only material that can be applied as a pre-harvest spray without residue.

Prompt application of wettable and liquid lime-sulphur prevents the development of gooseberry rust [*Puccinia pringsheimiana*: ibid., xvi, p. 476], liquid lime-sulphur apparently being preferable both against this disease and mildew (*Sphaerotheca mors-uvae*) [ibid., xv, p. 449]. Pre-blossom applications are the most important. One of the most effective ways of controlling the rust is to burn the sedge [*Carex*] leaves.

Under the conditions locally prevailing, dust or spray applications against hop downy mildew [*Pseudoperonospora humuli*: ibid., xviii, p. 236] can be delayed until a week before blossoming when the rainfall in June is much below average. Except in years when rainfall is abnormally heavy in spring, the critical period for control begins and terminates in July. Sprays containing lime reduce the average weight per cone by about 20 per cent. even when the final application is given before the cones develop. The spray recommended is Bordeaux mixture (4–2–100) plus $\frac{1}{4}$ per cent. cottonseed oil to reduce lime injury; even in gardens free from mildew this spray by reducing leaf-hopper infestation greatly increases yields.

Department of Botany.—*Rep. Pa agric. Exp. Sta., 1938–9* (*Bull.* 382), pp. 34–38, 1 fig., 1939.

In this report [cf. *R.A.M.*, xviii, p. 442] C. C. Wernham and H. B. Musser state that isolations from grasses on diseased patches of turf not amenable to mercury treatment on golf courses in Pennsylvania showed the presence of a foot rot organism (*Helminthosporium* sp.). Turf affected by snow mould [*Calonectria graminicola*: ibid., xviii, p. 298] showed a constant association between this disease and *Typhula itoana* [loc. cit.].

W. S. Beach states that when applied to tobacco trash used as a source of infection of wildfire [*Bacterium tabacum*: ibid., xviii, pp. 553, 784], Bordeaux mixture was more effective than other copper fungicides tested but did not prevent infection in seed-beds in which the plants had been atomized with a virulent culture of the organism. Intercropping tobacco with maize in alternate strips of four to six rows each reduced losses to 5 per cent., as against 30 per cent. in control rows of tobacco only. Shading and competition by the maize reduced the weight of the tobacco crop by about one-third. In plantings sown on different dates the amount of disease that developed appeared to depend on rainfall distribution. Soil in which affected tobacco leaves had decayed from autumn to spring failed to give rise to wildfire in the new crop. Two years' tests demonstrated that autumn sterilization of seed-beds is an important factor in control.

In work by J. W. Sinden on mushroom [*Psalliota* spp.]-growing piles of manure and synthetic compost were turned at intervals of 2, 4, 6, and 8 days for 24 to 32 days, and it was found that decomposition was most rapid and final loss of weight greatest when the piles were turned

every 6 days. Manure turned every other day lost dry weight slowly for 24 days, after which no further loss or heating occurred. Manure decomposed for 24 days and turned every other day produced the best crop of mushrooms, but when it was composted 8 days longer scarcely any mushrooms were produced. On the whole, both manure and synthetic compost gave the best yield in those piles which lost the least dry weight. Spore prints of valuable strains of mushrooms were kept viable for nine years. They were freed from contamination by keeping them long enough to allow the contaminants to die.

W. S. Beach found that species of *Trichoderma* caused much spotting, distortion, and splitting of mushroom stems and caps, some flushes being 10 per cent. affected. If the casing soil is dried out beforehand, it would appear to be safe to spray bearing beds with commercial formaldehyde at the rate of 1·5 to 2 lb. per 1,000 sq. ft. of bed surface, after diluting the spray material to 1 in 100. This treatment may cause 4 to 15 per cent. russeting, but the affected mushrooms remain suitable for canning.

Experiments by H. W. Thurston and H. N. Worthley showed that certain combinations of wettable sulphur with liquid lime-sulphur [against *Venturia inaequalis*] caused less injury to apples than lime-sulphur alone [ibid., xviii, p. 186], a combination of lime-sulphur 1 in 100 plus 4 lb. catalytic sulphur giving very promising results.

[Jensen (J. H.).] **Plant disease investigations.**—*Rep. P. R. agric. Exp. Sta., 1938*, pp. 121–129, 2 figs., 1939.

Further studies on bunchy top of papaw [*R.A.M.*, xviii, p. 375] showed that nymphs and adults of *Empoasca papayae* ultimately induced in healthy plants symptoms resembling those of the disease. Leafhoppers, probably of the same species, on papaw foliage were parasitized by *Entomophthora* [*Empusa*] *apiculata* [ibid., xix, p. 149].

Vanilla plantings on the Station grounds showed over 10 per cent. wilt or root rot, involving the destruction of the cortex and steles of the roots, in the parent bed and more than 33 per cent. in a recently replanted site where the crop had been abandoned some years ago on account of the disease. An inspection of twelve plantings covering over 100 acres showed that those six months old or less were free from attack, whereas all but three containing plants of one year old and upwards were infected; the incidence of the disease, which in the majority of cases was associated with a species of *Fusarium*, ranged from 1 to 90 per cent.

Stapp (C.) & Pfeil (E.). **Der Pflanzenkrebs und sein Erreger Pseudomonas tumefaciens. VIII. Mitteilung. Zur Biochemie des Krebsgewebes.** [Crown gall of plants and its agent *Pseudomonas tumefaciens*. Note VIII. On the biochemistry of the crown gall tissue.]—*Zbl. Bakt.*, Abt. 2, ci, 14–17, pp. 261–286, 1 fig., 1939.

In continuation of the studies of the first-named worker and collaborators on various aspects of crown gall of plants (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, xviii, p. 160], an investigation was made of the biochemical changes induced by the pathogen in the host tissues. The two strains used in the tests were Ra from dahlia and

IIb from *Chrys*[*anthemum*] *frut*[*escens*]. Most of the trials were carried out on sugar beets, supplemented in a few instances by Lucullus tomatoes, *Pelargonium*, and *Datura tatula*.

In the tumour tissues the hydrogen-ion concentration, the total sugar content, the fermentative capacity, and the calcium and magnesium contents were reduced in comparison with the sound material, whereas the glucose, nitrogen, phosphorus, and potash contents, and (in most cases) the dry substance were increased [ibid., xii, p. 148; xviii, p. 381]. Such deviations from the normal as were observed in the adjacent tissues were inconsiderable, the values of the latter approximating to those of healthy organs. There were no essential biochemical differences between infected plants receiving a combined mineral and organic or a pure mineral fertilizer. The galls induced by strain Ra were mostly smooth, while IIb tended to impart a rough, fissured context to the surface; moreover, the IIb tumours showed stronger catalase activity and slightly higher calcium values but a lower surface tension than those of Ra.

It is evident from these data that crown gall tumours differ very considerably in their biochemical constitution from other plant excrescences, such as potato wart tumours (*Synchytrium endobioticum*) [ibid., xvi, p. 120], the latter having a higher hydrogen-ion concentration and an increased calcium content but low ash, phosphorus, and potash contents in comparison with healthy plants. On the other hand, there are striking parallels between the galls of *Bact. tumefaciens* and malignant neoplasms in man and animals [ibid., xviii, p. 238], especially as regards the raised calcium and lowered magnesium contents, the decreased surface tension, and the reduced total sugar content.

LOCKE (S. B.), RIKER (A. J.), & DUGGAR (B. M.). **Production of growth substance on peptone broth by crown gall bacteria and related nongall forming organisms.**—*J. agric. Res.*, lix, 7, pp. 519–525, 1 graph, 1939.

In these further studies conducted by the authors [*R.A.M.*, xvii, p. 798] it was found that single-cell cultures of a virulent and an attenuated strain of the crown gall organism *Phytomonas* [*Bacterium*] *tumefaciens* and of the non-pathogenic *Bacillus radiobacter*, which differ widely in their pathogenicity, although similar in physiology, exhibited no significant differences in their ability to produce growth substance in peptone broth. The results are held to provide no support for the view that growth substances produced in such cultures have a direct major relation to the pathogenicity of crown gall bacteria [ibid., xvii, p. 448].

LOCKE (S. B.), RIKER (A. J.), & DUGGAR (B. M.). **The nature of growth substance originating in crown gall tissue.**—*J. agric. Res.*, lix, 7, pp. 535–539, 1939.

In this study growth substances obtained by ether extraction from tomato crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) [see preceding abstract] tissue, tomato foliage, and crown gall cultures on peptone broth proved to be much more stable in basic solutions than in acid ones. This indicates that beta-indole-acetic acid or some substance

similar to it in sensitivity to acid and alkali was present, while there was no evidence of the presence of auxin *a* or *b*, or of any other growth substance unrelated to beta-indole-acetic acid. The growth substance obtained from the foliage of normal plants was indistinguishable from that in the crown gall culture, so that it is not possible at the present to say whether the growth substance in crown gall tissue comes from the plant or the crown gall bacteria.

BERGEY (D. H.), BREED (R. S.), MURRAY (E. G. D.), & HITCHENS (A. P.). **Manual of determinative bacteriology.** Fifth Edn.—xi+1032 pp., London, Baillière, Tindall & Cox, 1939. 55*s*.

The present edition of the late Dr. Bergey's Manual contains descriptions of 1,335 species of bacteria, as compared with 832 in the first edition [*R.A.M.*, iii, p. 18]. [A detailed discussion of the basis of classification adopted in this edition is given by W. H. Burkholder in *Phytopathology*, xxix, 2, pp. 128–135, 1939.]

WATERHOUSE (W. L.). **Some aspects of plant pathology.**—*Rep. Aust. Ass. Adv. Sci.*, xxiv, pp. 234–259, 2 figs., 2 graphs, 1939.

In this presidential address to Section K of the Australian and New Zealand Association for the Advancement of Science the author, after referring to the financial losses caused by plant diseases, briefly summarizes the progress made in plant pathological work in New Zealand and Australia, and discusses various aspects of the problems connected with the cereal rusts (*Puccinia* spp.), with special reference to physiologic specialization.

MELCHERS (L. E.) & JOHNSTON (C. O.). **The Wheat stem and leaf rust epidemics of 1938 in Kansas.**—*Plant Dis. Reptr, Suppl.* 116, pp. 51–68, 3 diags., 2 graphs, 1939. [Mimeographed.]

This is a tabulated survey of the meteorological conditions leading up to the stem and leaf rust [*Puccinia graminis* and *P. triticina*] epidemics in 1938 [*R.A.M.*, xviii, p. 663; xix, pp. 75, 139] in Kansas, where 1935 and 1937 were also years of severe stem rust outbreaks. Factors that generally limit infection, development, and spread of stem rust in Kansas are rainfall and recurrent dews. It does not usually spread in central or northern Kansas because of lack of rainfall in May or early June. Precipitation in 1938 was well distributed during these months. Minimum and maximum temperatures have been shown to be more important factors than mean temperatures, and until minimum temperatures become high enough for uredospore germination heavy stem rust inspections do not occur. Taking the minimum favourable temperature as 60° F. there were several infection periods in north-eastern and southern Kansas during 1938, and the minimum temperatures for May and June were the deciding factor in the epidemic in eastern, central, and western Kansas.

Meteorological conditions favouring stem rust also favoured leaf rust, but the latter is able to develop over a wider range of temperature than the former, especially at temperatures below 60°. Periods favourable for infection in May were not short as for stem rust but prolonged. The leaf rust epidemic was not only unusually heavy, causing a loss (conservatively estimated) of 12 per cent. for the State, but certain

varieties, such as Kawvale, which are ordinarily resistant in the field, were severely attacked. Physiologic race 9 [ibid., x, p. 363; xix, p. 10] was the most widespread, followed by 15 and 37.

PETURSON (B.) & NEWTON (MARGARET). **The effect of leaf rust on the yield and quality of Thatcher and Renown Wheat in 1938.**—*Canad. J. Res.*, Sect. C, xvii, 11, pp. 380–387, 1939.

In two experiments carried out at Winnipeg in 1938 to ascertain the effect of leaf rust (*Puccinia triticina*) on the yield and quality of wheat, Thatcher and Renown wheat were sown late in 1/400-acre plots, and Thatcher only was sown early in rod-row plots. Half the plots of each variety were given frequent applications of sulphur dust, and the remainder was left untreated. In the former test, infection reduced the yield of Thatcher and Renown by 51·17 and 29·61 per cent., respectively, while in the latter it reduced the yield on Thatcher by 37·02 per cent. Decreased yield was due mostly to reduced number of kernels per head. All the untreated plots ripened about three days before the dusted ones, and the grain from the former was one grade lower than that from the latter. Further, the grain from the dusted plots of both varieties was higher in protein and lower in carotene than that from the untreated plots.

PADWICK (G. W.). **Note on the limitation of infection of Wheat by ascospores of Ophiobolus graminis Sacc. A possible explanation.**—*Ann. appl. Biol.*, xxvi, 4, pp. 823–825, 1939.

In experiments conducted in 1933 at the Imperial College of Science and Technology, London, single-spore cultures of *Ophiobolus graminis*, used to infest the soil in experimental pots, produced infection and ascospores on plants of Little Joss wheat, thus confirming the conclusion of Davis [*J. agric. Res.*, xxxi, 9, pp. 801–825, 1925] that the fungus is homothallic [*R.A.M.*, xix, p. 141]. It was observed that single spores removed from Petri dishes to tubes with fresh agar took several weeks to germinate, whereas those remaining in the dishes germinated within 24 hours. The explanation offered for this retardation of germination is that some chemical substance produced by the ascospores or the perithecia and necessary for the germination of the spores may become too dilute on their removal to fresh agar. It is suggested that this delay may prove fatal under non-sterile conditions where the spores have to compete for nutrients with other fungi, and may account for Garrett's failure to produce infection of wheat by ascospores in unsterilized soil [ibid., xviii, p. 386].

WINTER (G.). **Der Einfluss der physikalischen Bodenstruktur auf den Infektionsverlauf bei der Ophiobolose des Weizens.** [The influence of the physical structure of the soil on the course of infection in Wheat ophiobolosis.]—*Z. PflKrankh.*, xlix, 10–11, pp. 513–559, 1 graph, 1939.

Garrett's method for the estimation of the extent of wheat infection by *Ophiobolus graminis* by the direct measurement of the runner hyphae of the fungus along the roots [*R.A.M.*, xiii, p. 433] was recently tested at the Bonn Phytopathological Institute and found to be superior to any of the others suggested for the purpose.

There is reason to believe that statements regarding an enhanced incidence of foot rot on the more compact types of soil are based either on the abundance of inoculum provided in such sites by susceptible grasses or else on the inadequate ploughing-under of the diseased stubble. In natural soil *O. graminis* is incapable of active saprophytic growth, and in its pseudosaprophytic phase the mycelium is subject to microbiological decomposition. The writer's inoculation experiments with monospore cultures maintained since 1936 on 2 per cent. malt agar at room temperature showed the fungus to be pathogenic to a number of grasses, including *Anthoxanthum odoratum*, *Agrostis spica-venti*, *Lolium temulentum*, *L. perenne*, *L. remotum*, *L. westerwoldicum*, *Dactylis glomerata*, *Bromus inermis* (very heavy infection, killing the plants shortly after emergence), *B. unioloides*, *B. mollis*, *B. hordeaceus*, *B. secalinus*, *B. patulus*, and *B. sterilis*, forming perithecia after five months on *A. spica-venti*, *Poa trivialis* (which in common with a number of other grass hosts harbouring abundant mycelium showed no external symptoms), the four *L.* spp., and the three last-named *B.* spp. The liability of these weeds to attack by *O. graminis* assumes considerable importance in the light of the rapid decline of soil inoculum in the absence of susceptible crops, and the inability of the fungus to spread through the soil except on its own hosts.

In pot experiments the compacting of loose soils led to a uniform reduction in the incidence of infection by the three physiologic races tested (S4, S23, and S28) [cf. ibid., xvi, p. 524], the decrease being generally most pronounced in moist substrata and associated with a deterioration in the aerating activity of the soil. In sterilized soils with a sufficient moisture content (50 per cent.) the adverse effect of compacting on the pathogen increased in proportion to the amount of clay or humus in the substratum, whereas in natural soils the position was reversed, probably through the operation of some modifying edaphic factor. In sterilized soils of low moisture content (20 per cent.) the compacting effect is strongest in sandy soils. In field experiments with summer and winter wheats, compacting of the seed-beds likewise caused a marked reduction of foot rot, e.g., from 223 to 52, 113 to 26, and 98 to 18 plants, in different plots. Generally speaking, the beneficial effects of soil-compacting are likely to be more noticeable in summer than in winter wheat; in any case little improvement can be expected in soils heavily infested by mycelium.

The growth of the inoculum of *O. graminis* in the soil appears to be accelerated by a loose soil structure, so that the control of foot rot through agricultural practices should fall under two heads; (*a*) the retardation of infection by compacting the soil during the growth of susceptible crops; and (*b*) the elimination of soil infestation by the provision of a loose texture during the cultivation of non-susceptible plants.

SCHLICHTLING (ILSE). **Untersuchungen über die physiologische Spezialisierung des Weizenmehltaus, Erysiphe graminis tritici (DC.), in Deutschland. Vorläufige Mitteilung.** [Studies on the physiologic specialization of Wheat mildew, *Erysiphe graminis tritici* (DC.), in Germany. Preliminary note.]—*Kühn-Arch.*, xlviii, pp. 52–55, 1939.

A tabulated account is given of the writer's experiments at the Halle

Agricultural and Plant Breeding Institute on physiologic specialization in wheat mildew (*Erysiphe graminis tritici*) [*R.A.M.*, xviii, p. 385], some 50 German isolations of which, collected in 1936 and 1937 on Carsten V and Krafft's Dickkopf, were available in the conidial stage. The varieties inoculated by the fungus (in the form of aqueous suspensions applied to the leaves of ten-day-old seedlings at 15° to 22° C.) included the American selections of Dixon, Huron, and Illinois used by Mains in similar investigations [ibid., xii, p. 362], Red Fern, a strain of Black Persian, Vik's Norwegian Fram [ibid., xvii, p. 384], and forms of spelt, *Triticum durum*, *T. dicoccum*, *T. monococcum*, and *T. timopheevi*. Six physiologic races, all distinct from the two recognized by Mains, were differentiated on the basis of these tests, and it is considered probable that others also occur in Germany. For instance, the normally highly resistant Normandy variety was severely attacked in the field in the summer of 1938 by a strain which awaits analysis on the standard assortment.

GRACE (N. H.). **Effects of plant and animal hormones on seeds damaged by formaldehyde.**—*Canad. J. Res.*, Sect. C, xvii, 12, pp. 445–451, 1939.

When Marquis wheat seed was immersed in solutions of formaldehyde or of formaldehyde containing either naphthylacetic acid or oestriol, an oestrogenic hormone, in concentrations of 0·1, 1, 5, and 10 p.p.m., and was germinated on blotting paper, both the oestriol and the naphthylacetic acid reduced formaldehyde injury equally [cf. *R.A.M.*, xvii, p. 802]. Growth of the treated seed in soil, however, showed no reduction in formaldehyde injury by either material. Germination counts after nine days on blotting paper indicated that though formaldehyde treatment did not reduce germination significantly, very significant effects were apparent in decreased length of stem and increased number of seminal roots per seedling. Formaldehyde injury was even more marked on plants grown in soil.

In another experiment, in which Marquis wheat seed was sprinkled with solutions of formaldehyde and indolylacetic acid and grown in soil, a treatment of 1 p.p.m. of indolylacetic acid reduced injury to a statistically significant extent, but 0·02 or 0·2 p.p.m. were insufficient.

HAYES (H. K.), MOORE (M. B.), & STAKMAN (E. C.). **Studies of inheritance in crosses between Bond, Avena byzantina, and varieties of A. sativa.**—*Tech. Bull. Minn. agric. Exp. Sta.* 137, 38 pp., 6 figs., 1939.

In these investigations Bond oats were crossed with *Avena byzantina*, and several varieties of *A. sativa*, including Anthony, Iogold, Rainbow, and two selections called Double Cross A and Double Cross B derived from previous crosses of (Minota × White Russian) × Black Mesdag oats and the results studied with reference to the manner of inheritance of characters differentiating varieties of *A. byzantina* and *A. sativa*, and the reaction of these varieties to stem rust (*Puccinia graminis avenae*), crown rust (*P. coronata*), and smuts (*Ustilago avenae* and *U. levis*). It was found that stem rust was dominant to susceptibility, segregation in the F_2 and F_3 being explained on the basis of a single-factor difference. The physiologic races of stem rust used were

those to which White Russian was resistant. Bond was resistant to all the physiologic races of crown rust used, though in two seasons a race of crown rust appeared to which Bond was susceptible [*R.A.M.*, xviii, p. 794]. The F_1 generation of all crosses was resistant, though less so than Bond. The F_2 generation of the cross between Bond and Rainbow approached a ratio of 3 resistant to 1 susceptible, indicating only a single-factor difference; the other crosses gave a segregation of resistant to susceptible in a 9 : 7 ratio, indicating two major factors for differentiating resistance and susceptibility. For both rusts agreement was good between seedling reaction in the greenhouse to a single race and field reaction to the collection of races used.

Bond and Double Crosses A and B were resistant to the smuts under field conditions. In the cross between Bond and Double Cross A some susceptible lines occurred in the F_3 generation, showing that the factor or factors responsible for resistance were unlike in the Bond and Double Cross A parents. In the crosses of Bond with Iogold and Anthony there were indications of a single major-factor difference, with some evidence of minor modifying factors.

It is concluded that it should not be difficult to combine resistance to these diseases with the characters of cultivated varieties of *A. sativa* and plumpness of grain.

CAMPI (MARIA D.). **'Helminthosporium turcicum' Pass. en la Republica Argentina.** [*Helminthosporium turcicum* Pass. in the Argentine Republic.]—*Lilloa Rev. Bot. Tucumán*, iv, 1, pp. 5–32, 6 pl., 8 figs., 3 graphs, 1939. [English summary.]

This is a comprehensive study on maize blight (*Helminthosporium turcicum*) [*R.A.M.*, xviii, p. 517], which is stated to be very prevalent in the Argentine, where it is here recorded for the first time on Sudan grass and Kaffir sorghum.

Inoculation experiments on maize plants in a saturated atmosphere with conidial suspensions of the fungus from 1 per cent. potato glucose agar cultures resulted in 81 per cent. infection, the punctiform, chestnut, reddish, or straw-coloured necrotic lesions with pale margins developing on the leaves in 24 to 48 hours. Infection may take place through the stomata or directly by penetration of the cuticle. *H. turcicum* grows well on various standard media at 20° to 30° C., conidial production being most profuse at the lower limit. The dimensions of the conidia formed in culture are generally smaller than those of the same organs in their natural habitat; for instance, on potato glucose agar the mean measurements of three collections were 89·4 by 19·0, 86·9 by 17·3, and 92·2 by 17·9μ, respectively, the average number of septa ranging from 5·0 to 5·8, compared with means of 103·9 by 22·5 and 99·1 by 22μ, respectively, with 5·1 to 5·4 septa, for conidia taken directly from the host tissues. The optimum hydrogen-ion concentration for *H. turcicum* was found to be P_H 5·7.

STOREY (H. H.). **Investigations of the mechanism of the transmission of plant viruses by insect vectors. III. The insect's saliva.**—*Proc. roy. Soc.*, Ser. B, cxxvii, 849, pp. 526–543, 1 pl., 2 figs., 1939.

In further studies on the transmission of streak disease of maize by

Cicadulina mbila [*R.A.M.*, xviii, p. 727], observations were made on the insect penetrating a wax membrane and feeding on sugar solution. The maxillary stylets pierced the membrane in a series of jerky, advancing and retiring movements, and during withdrawal only a colourless saliva, which immediately set to a gel, was ejected, and moulded by the continued movements of the stylets into a sheath. Although evidence seems to point to the jelling saliva as the vehicle of virus inoculation, in previous experiments [ibid., xvii, p. 387] no infection was obtained with a feeding time of less than 5 minutes. The present work has shown the maximum excretion of saliva to take place in the shorter time between penetration and the beginning of feeding, and no other material of insect origin was observed to flow from the stylets so that the manner in which *C. mbila* introduces the virus still remains obscure.

When the salivary glands of infective *C. mbila*, washed in sterile saline to remove possible surface contamination from the blood stream, were inoculated into the abdomens of non-infective ones, a few of the latter became infective. Positive results were also obtained with mid-intestines of insects fed on diseased plants, while other organs, which were as likely to carry a surface contamination from blood as the salivary glands, gave negative results, thus supporting the conclusion that the salivary glands may contain virus, either occasionally or in very small quantities.

Inoculation or feeding of non-infective *C. mbila* with fluids upon which the infective ones had fed failed to render the former infective; simultaneous feeding of both infective and non-infective insects on a film of fluid held between two membranes gave positive results in one out of 16 sets of experiments, but these newly infective insects never caused infection in more than one test. Similarly, inoculation of non-infective insects with juice from crushed maize leaves upon which infective ones had fed gave negative results, and only simultaneous feeding on a small area of a leaf caused a few non-infective insects to become infective, although again these were of low infective ability. It is suggested, on the basis of these results, that infective *C. mbila* eject virus in such small quantities that rarely enough reaches a non-infective insect to make it infective, and then only weakly so.

KARLING (J. S.). **A new fungus with anteriorly uniciliate zoospores: Hyphochytrium catenoides.**—*Amer. J. Bot.*, xxvi, 7, pp. 512–519, 18 figs., 1939.

A description [with Latin diagnosis] is given of a new fungus, *Hyphochytrium catenoides*, found to occur as a saprophyte or weak parasite in the trichomes and parenchyma cells of portions of maize leaves used in inoculation experiments with *Physoderma zeae-maydis* [*P. maydis*: see Mundkur 'Fungi of India, Supplement I', p. 7, 1938]. The species is characterized primarily by anteriorly uniciliate zoospores. So far no sexual organs or resting spores have been found.

MCNEW (G. L.) & SPENCER (E. L.). **Effect of nitrogen supply of Sweet Corn on the wilt bacterium.**—*Phytopathology*, xxix, 12, pp. 1051–1067, 2 figs., 2 graphs, 1939.

In further studies on the influence of nitrogen on the reaction of Golden

Bantam maize seedlings to wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) infection [*R.A.M.*, xvii, p. 518; xviii, p. 173], the addition of this element to the nutrient solution increased the concentration of nitrogen in the tracheal sap, and when this amounted to 20 to 40 p.p.m. the bacteria invaded the seedlings; when larger quantities were supplied (to induce a nitrogen concentration in the sap of 270 p.p.m.) the rapid assimilation of the nutrient by the plants quickly led to its exhaustion, so that soon after feeding there was an insufficient amount to promote good bacterial growth. Virulent strains of the organism tended to develop more profusely in plants given nitrogen than in those from which this element was withheld, though in some of the tests virulent strains persisted for lengthy periods in nitrogen-deficient seedlings. It was experimentally shown that feebly and strongly virulent strains were about equally aggressive in seedlings deprived of nitrogen, whereas highly pathogenic forms were stimulated to more intensive activity by heavy additions of the nutrient.

A motile contaminant, isolated from nitrogen-deficient seedlings and secreting a brown pigment on agar slants after two to three weeks, proved equally virulent with *A. stewarti* in plants without nitrogen but much less so in those supplied with the element.

Vladimirsky (S. V.). Географическое распространение и зоны вредоносного значения спорыньи на Ржи в СССР. [Geographical distribution and zones of injurious influence of ergot on Rye in the U.S.S.R.]—*Sovetsk. Bot.*, *1939*, 5, pp. 77–87, 13 graphs, 1 map, 1939.

Observations on the development of ergot (*Claviceps purpurea*) [*R.A.M.*, xix, p. 95] on rye in various parts of the U.S.S.R. [ibid., xvi, p. 31] made during 1934–5 showed that the period of rest required by the organism prior to the germination of sclerotia lasts under natural conditions for about eight to nine months. The sclerotia germinate in the spring at a temperature of about 11° C. and the process is greatly favoured by moist soil conditions in the previous autumn. Sclerotia which fail to germinate in the spring usually lose their viability before the autumn of the same year. The stromata develop within ten days at optimal meteorological conditions (temperatures above 12·2° and high humidity), but take about a month or more when temperatures are low or variable and there is a lack of moisture. The perithecia take five to seven days from the appearance of the stroma to mature (i.e., to eject ascospores) under conditions of high humidity (76 to 78 per cent. saturation) and precipitations of not less than 21 mm., but the period is prolonged to between 15 and 30 days at lower humidity. The greatest development of ergot infection (over 10 per cent.) was observed in regions where the following conditions obtained: (1) a relative humidity during flowering (most usually the third ten days of June) of 74 per cent. or above (or not less than 70 per cent. during the time of flowering and the previous two ten-day periods); (2) a temperature at the beginning of flowering not above 13° to 15°; and (3) a flowering period of 14 days. Medium development of ergot infection (1·4 to 2·8 per cent.) occurred when the relative humidity during the time of flowering and the previous two ten-day periods was about 60 per cent., whereas one of 55 to 58 per cent. during the same period strikingly reduced

development. The regions with optimal, intermediate, and adverse meteorological conditions for the development of ergot are separated into three groups, which roughly coincide with the regions of maximum, medium, and minimum economic importance of the disease. Data are given on the geographical distribution of ergot on the territory of the Union during the periods 1834 to 1930 and 1932 to 1936. It appears that serious epidemics occur most often in the northern and north-eastern districts, and less frequently in the central belt, while in southern and south-eastern districts only isolated infected plants have been observed.

TYLER (L. J.). **Variation in Sphacelotheca sorghi (Link) Clinton.**—*Tech. Bull. Minn. agric. Exp. Sta.* 133, 48 pp., 8 figs., 2 graphs, 1938. [Received January, 1940.]

The cytological phenomena associated with chlamydospore germination in potato dextrose agar cultures of *Sphacelotheca sorghi*, the causal organism of covered kernel smut of sorghum [*R.A.M.*, xviii, p. 18], revealed much greater variability and more extensive deviation from the normal type than hitherto accepted. Essentially the life-cycle of *S. sorghi* resembles that of several species of *Ustilago*.

Sex in *S. sorghi* may be conveniently and reliably determined by sporidial fusions and the Bauch test [ibid., vi, p. 744]. Evidence was obtained in confirmation of Rodenhiser's observation that the sexual compatibility of paired lines may be ascertained soon after sorghum plants have been inoculated. Segregation of sex factors was apparently complete in the first or second nuclear division of the germinating spore. Two sex groups were distinguished, with factors for sex segregating in the ratios of 2 : 2 and 1 : 3. The existence of more than two (probably three) sexual compatibility groups was demonstrated. The segregation of factors for cultural characters in four ratios of 2 : 2, 4 : 0, 3 : 1, and 2 : 1 : 1 was shown to take place independently of those governing sex.

In artificial culture *S. sorghi* falls into an indefinite number of types differing in one or more of the following characters: size, colour, growth habit and direction, consistency of colonies, topography, and type of margin. Further studies are necessary to establish the pathogenicity and consequent importance of paired compatible lines arising as sectors through mutation. Sectoring was stimulated by certain nutrients, e.g., malt agar and plain sugar media plus nitrogenous salts, and was largely confined to certain lines. Fourteen lines remained culturally constant for over a year on potato dextrose agar, but eight of them produced one or more sectors of new cultural type on transference to malt agar. Lines of *S. sorghi* derived from intraspecific hybridization between monosporidial lines from different chlamydospores varied in pathogenicity, as indicated by stunting of the infected plants, colour of the peridia, size and hardness of smut balls, chlamydospore dimensions, and period required for chlamydospore germination.

BATES (G. R.). **Recent developments in the processing of Rhodesian Oranges.**—*Proc. Rhod. sci. Ass.*, xxxvii, pp. 29–35, 1939.

About 90 per cent. of the decay in Rhodesian oranges exported to England is due to *Penicillium digitatum* [*R.A.M.*, xvii, p. 310], though *P. italicum* [ibid., xix, p. 88] also causes appreciable loss. Rot due to

Diplodia natalensis [loc. cit.] is most commonly found in the earliest varieties, infection in nature generally arising from the button tissues. Infection by *Alternaria citri* [ibid., xvii, p. 310] occurs in a similar way, and may cause a stem-end, blossom-end, lateral, or black centre rot, of which the last is commercially the most serious. Anthracnose (*Colletotrichum gloeosporioides*) [ibid., xvii, p. 311; xix, p. 87] may develop as a lateral rot or a semi-pliable stem-end rot, frequently in association with *A. citri*; it chiefly attacks late shipments of mature oranges. Both fungi are regularly and extensively present as latent infections in the rind of small, immature oranges, and are completely resistant to ordinary fungicidal treatment. Mature oranges with poor storage and carrying qualities are very susceptible to latent infections.

The development of mould decay, particularly *P. digitatum*, during wilting is accompanied by a marked increase in atmospheric spore content and spore load on the fruit. Shortening wilting to a period of 24 to 48 hours reduced transit decay without causing excessive shrinkage or loss of weight, and also minimized 'ageing'. Wilting for one or two days is regarded as sufficient in Rhodesia, unless the fruit has been rendered turgid by rain or irrigation, in which case it is submitted to preliminary wilting for 24 hours or more in the grove before dispatch to the packing-house.

P. digitatum was controlled by using wrappers impregnated with orthophenylphenol [ibid., xviii, p. 805], but unless used at very low concentrations this chemical causes rind injury, largely preventable, however, by incorporating a glyceride oil such as olive or groundnut oil into the wrappers.

Sooty blotch and fly speck [the fungi involved have not yet been ascertained definitely in Rhodesia] have become increasingly prevalent on oranges from the Mazoe valley. The former can be removed in 30 to 45 seconds, and the latter in about twice this time, by dipping in a solution containing 4 oz. bleaching powder [chloride of lime] and 3 oz. sodium bicarbonate per gal. water. If fungal decay is troublesome, a modified solution containing chloride of lime and boric acid may be substituted.

During rail transport oranges, until they attain about 40° F., continue active transpiration, the process sometimes being accompanied by physiological rind injury due to excessive desiccation of the cell tissues. Wrappers, if too retentive of moisture, may induce mould decay; if, however, waxed paper box-liners could be used in conjunction with orthophenylphenol wrappers, the combination might have far-reaching results. Local experiments indicate that type of fertilizer and cultural methods may influence low temperature injury in oranges.

MILLER (E. V.) & SCHOMER (H. A.). **Physiological studies of Lemons in storage.**—*J. agric. Res.*, lix, 8, pp. 601–607, 1939.

An account of this work has already been noticed from another source [*R.A.M.*, xviii, p. 673].

DASTUR (J. F.). **Stem breaking of Cotton.**—*Agric. Live-Stk India*, ix, 6, pp. 685–687, 2 pl., 1939.

A stem-breaking disease of cotton occurring in epidemic form in the

Nimar district, Central Provinces, in 1938 is described. Its most conspicuous feature is the bending over of the plants about ½ to 2 in. from above the collar or soil-level. The varieties affected included Verum 434, Verum 262, and deshi, the first-named raised from delinted seed. The fungi isolated from the broken parts of the stem, *Fusarium* spp., *Rhizoctonia bataticola* [*Macrophomina phaseoli*: *R.A.M.*, xviii, p. 674], and *Colletotrichum* sp., were confined to the dead tissues, and the trouble is tentatively ascribed to the effect of persistent wind of abnormally high velocity on plants of unduly luxuriant growth.

MILLER (P. R.) & WEINDLING (R.). **A survey of Cotton boll rot diseases in 1939 and the microorganisms associated with them.**—*Plant Dis. Reptr*, xxiii, 20, pp. 329–334, 2 maps, 1939. [Mimeographed.]

The results [which are tabulated and briefly discussed] of a survey carried out during 1939 in the cotton-growing regions of the United States to ascertain the prevalence and relative distribution of the fungi associated with boll rot [*R.A.M.*, xviii, pp. 519, 787] confirmed the previous evidence of the prevalence of *Glomerella gossypii*. This species was present in 82·3 per cent. of the fields examined, or in 90·1 per cent. if Texas and Oklahoma are omitted. It was obtained in culture from 29·9 per cent. of 2,959 bolls, but was found in fewer from Louisiana and Arkansas than from more easterly States (3·8 and 5·1 per cent., respectively, as against 33·2 per cent. in Mississippi and 34·7 per cent. in Alabama).

An interesting result of the survey was the evidence of the prevalence and frequency of *G. gossypii* in the eleven cotton States east of Texas and Oklahoma and its apparent absence to the west of this region; it may be significant to note the apparent correlation of the general extent of the disease with high humidity.

The other boll rot organisms most frequently found were again *Alternaria* spp., *Fusarium moniliforme* [*Gibberella fujikuroi*: ibid., xix, p. 89], and *F.* spp.

BARDUCCI (T. B.). **Departamento de Genética Vegetal. Memoria de la Sección Genética de Algodon (Valle de Lima).** [Department of Plant Genetics. Memorandum of the Section of Cotton Genetics (Lima Valley).]—*Mem. Estac. exp. agric. Soc. nac. Agr., Lima*, 11a, pp. 285–321, 5 col. pl., 28 figs., 16 graphs, 1939. [Received February, 1940.]

One of the chief problems engaging the attention of cotton geneticists in Peru is the development of selections of the Tangüis variety combining resistance to wilt (*Verticillium* sp.) [*R.A.M.*, xviii, p. 25] with desirable commercial characters; outstanding from this point of view is the line Cñ–LM7–35. Some degree of tolerance has also been shown by Giza 7, introduced from Egypt in 1935, and to a lesser extent by Sakellaridis, Pima, S×P (1938–9), Sea Island, Semiáspero, and Riñón, in contrast to the susceptible representatives of the Upland group cultivated locally, viz., Mars Rose, Coker-Wilds, Miller, Dixie 14–5, Dixie Triumph, Delfos, and Acala.

Under local conditions in the Lima Valley the incidence of infection in stands from September-sown seed was shown by counts at 30-day

intervals during the growing seasons from 1935 to 1938 to increase most rapidly during January (from 30 to 80 per cent.), slower rises taking place in February and March (up to 90 or 95 per cent.), while the total in May reached 98 per cent. Data are adduced pointing to the inadvisability of unduly early sowing, e.g., in July, when the low soil temperature (mean of 17·5° C.) checks the normal growth of the seedlings and exposes them to ready infection by *V.* sp., favourable conditions for the development of which develop from August onwards. Other preventive measures should include judicious crop rotation; delayed irrigation to secure vigorous root development; dense stands to maintain regular and uniform soil humidity; use of superior, first-year seed; and thorough tillage of the soil, with strict attention to all practices tending to promote a strong root system, the avoidance of any injury to which is likewise of the first importance.

FRANCKE-GROSMANN (HELENE). **Über das Zusammenleben von Holzwespen (Siricinae) mit Pilzen.** [On the symbiosis of wood wasps (Siricinae) with fungi.]—*Z. angew. Ent.*, xxv, 4, pp. 647–680, 17 figs., 1 diag., 1939.

A comprehensive account is given of the writer's studies at the Tharandt (Saxony) School of Forestry on the symbiotic relationships between wood wasps of the genera *Xeris, Paururus* [*Sirex*], *Sirex,* and *Tremex*, and wood-destroying fungi, of which those associated with *S. gigas* [*R.A.M.*, xiii, p. 440] on fir and *T. fuscicornis* on walnut were identified as *Trametes odorata* and *Polyporus imberbis*, respectively, both characterized by a strong aroma (reminiscent of vanilla in the latter) [ibid., xix, p. 54]. The loss of weight in poplar blocks inoculated with *P. imberbis* from *Tremex fuscicornis* amounted to 19·7 per cent. of the total in three months, the corresponding figures for unidentified fungi from *Paururus* [*S.*] *noctilio* [cf. ibid., xiii, p. 341] and *P.* [*S.*] *juvencus, S. augur*, and *S. gigas* ranging from 3·2 to 13·5 and 1·8 to 4·2 per cent., on fir and pine blocks, respectively. The lignin and cellulose contents of the poplar blocks were reduced by 51·1 and 52·2 per cent. by *Polyporus imberbis* from *T. fuscicornis* during a period of five months, while the *Sirex* fungi caused losses of 1·9 to 22·8 per cent. cellulose and 12·8 to 16·3 per cent. lignin in fir blocks.

Generally speaking, the wood-destroying fungi from wasps form no fruit bodies in pure culture (on clarified malt gelatine), *P. imberbis* being the sole exception in these experiments. They occur in the insects in specific intersegmental organs. The wasps are thus of silvicultural importance, not only on account of the depredations made by their larvae, but also as vectors of wood-destroying fungi.

CHARLES (VERA K.). **Notes on entomogenous fungi.**—*Plant Dis. Reptr*, xxiii, 21, p. 340, 1939. [Mimeographed.]

Specimens of *Anopheles quadrimaculatus* from Florida were found to be parasitized by *Beauveria bassiana* [*R.A.M.*, xix, p. 72] and a species of *Spicaria*, both apparently new records for mosquitoes; the sweet potato weevil (*Cylas formicarius*) from Georgia by a species of *Fusarium* (and in a previous collection of 1935 from Mississippi by *B. globulifera*); and the Norway maple aphid *Periphyllus lyropictus* (a severe pest of

Hydrangea arborescens in New Hampshire) by *Empusa fresenii* [ibid., xviii, p. 157] in the conidial and resting spore stages, believed to be reported for the first time on this host.

MANN (H.). **Die Brandfleckenkrankheit beim Sumpfkrebs (Potamobius leptodactylus Eschh.).** [The scorch spot disease of the Marsh Crayfish (*Potamobius leptodactylus* Eschh.).]—*Z. Parasitenk.*, xi, 2–3, pp. 431–432, 1939.

Cephalosporium leptodactyli n. sp. [without a Latin diagnosis] was isolated on dextrose agar from marsh crayfish (*Potamobius leptodactylus*) in the vicinity of the Plattensee, Tihany, Hungary. The fungus, which is characterized by hyaline, septate hyphae, 3 to 4 μ in diameter, and concatenate, hyaline conidia, 9 to 13 by 3 to 5 μ, produces brownish-red to black spots of varying size on the shells.

CASTELLANI (A.). **Brief notes on three new species of Trichophyton (T. batonrougei, T. guzzonii, T. tenuishypha) and a little known species (T. louisianicum).**—*J. trop. Med.* (*Hyg.*), xlii, 24, pp. 373–378, 1 col. pl., 13 figs., 1939.

Full descriptions [without Latin diagnoses] are given of *Trichophyton batonrougei* n. sp., isolated from four cases of tinea capitis in negro children at New Orleans, *T. guzzonii* n. sp. from a case of ringworm of the dorsum of the foot in a negro boy, also at New Orleans, and *T. tenuishypha* n. sp. from a case of generalized pruritus in a European woman in London, formerly resident in the West Indies.

On 2 to 4 per cent. glucose agar and on milk agar *T. batonrougei* forms chestnut-coloured colonies and produces an abundant mycelium, of various types, occasionally including the racquet, the hyphae ranging from 2 to 4 μ in width (average 2·8 μ). Conidia and aleuriospores are extremely scanty. In hanging-drop peptone water cultures at 30° C. fusiform or lemon-shaped, rarely almost triangular, terminal and intercalary structures, presumably chlamydospores, have been observed, measuring 24 to 36 by 16 to 28 μ, containing (in the case of two strains of the fungus) peculiar sporiform bodies, 2 to 4 μ in diameter. *T. batonrougei* slowly liquefies gelatine but not coagulated serum, and does not clot litmus milk or produce gas from any of the sugars or other carbon compounds tested.

T. guzzonii is characterized on glucose agar by particoloured colonies, viz., orange, reddish or rust-coloured, and whitish, the surface of fully grown cultures after removal of the 'duvet' being brownish-black and often mammelonated, somewhat resembling those of *T. dankaliense* [*R.A.M.*, xvii, p. 319]. The hyphae of the luxuriant mycelium range from 1 to 2 to 6 to 12 μ in diameter. Neither aleuriospores, chlamydospores, nor closterospores have been detected. The biochemical characters of the fungus are similar to those of *T. batonrougei*.

The colonies of *T. tenuishypha* on glucose agar are fluffy, white at first, later turning black. The hyphae range from 1 to 3 μ in diameter, mostly 1·2 to 2·5 μ, and in the centre of the cultures may amalgamate into a sort of prosenchyma. Neither closterospores nor aleuriospores have so far developed. The biochemical characters of the fungus resemble those of the two foregoing.

T. louisianicum [ibid., vii, p. 169], isolated from tinea capitis in negro children at New Orleans, forms on glucose agar canary-coloured colonies, sometimes with reddish spots or a reddish to brownish margin at maturity. Hyphae are abundant and closterospores have also been observed, but no true aleuriospores. Milk agar is the most suitable medium for growth. Like the other fungi herein reported, *T. louisianicum* produces no gas from any sugar.

Inoculation experiments with these four species gave negative results.

Emmons (C. W.) & Hollaender (A.). **The action of ultraviolet radiation on dermatophytes. II. Mutations induced in cultures of dermatophytes by exposure of spores to monochromatic ultraviolet radiation.**—*Amer. J. Bot.*, xxvi, 7, pp. 467–475, 14 figs., 2 graphs, 1939.

In further studies on the effect of ultra-violet radiation on *Trichophyton mentagrophytes* [*R.A.M.*, xviii, p. 737], spores of a strain of this fungus isolated from a case of ringworm of the arm were exposed to ultra-violet light in the region of wave lengths of 2,280 to 2,950 Å. The treatment induced a temporary retardation of germination, which disappeared on subculturing, and the production of comparatively stable mutants. The latter differed from the parent strain and usually from each other in the degree or type of pigmentation, the rate of growth, or in the amount and type of aerial hyphae produced, and are accordingly placed in six arbitrarily delimited groups. Some of the mutants closely resembled other varieties of the fungus, indicating that the species is highly mutable. The mutant production showed a definite maximum at 2,537 to 2,650 Å. No mutants appeared in over 2,000 control colonies grown from non-irradiated spores, but as some mutants of this general type can be isolated from old non-irradiated cultures, it is believed that the exposure to ultra-violet radiation merely accelerates the normal process of mutation in this and other species of the dermatophytes.

Danbolt (N.) & Mossige (K.). **Sølvrev som smittekilde for trichophyti hos mennesker.** [The Silver Fox as a source of trichophytosis infection in Man.]—*Norsk VetTidsskr.*, li, 3, pp. 85–92, 6 figs., 1939. [English summary.]

At the Dermatological Clinic of Oslo University a number of persons engaged in raising silver foxes (a very important industry in Norway) were found to be suffering from trichophytosis due to *Trichophyton gypseum asteroides* [*T. mentagrophytes*: *R.A.M.*, xix, p. 92 and preceding abstract], which was isolated both from the patients and from the similarly affected animals and grown in pure culture on maltose, glucose, and peptone agar.

Perpignano (G.). **Le tigne della Provincia di Cagliari (ricerche cliniche batteriologiche e sperimentali).** [Ringworms of the Province of Cagliari (clinical, bacteriological, and experimental researches).] *G. ital. Derm. Sif.*, lxxx, 3, pp. 489–534, 2 pl., 1939.

This is a comprehensive survey of the author's studies on the 2,107 cases of ringworm [*R.A.M.*, xviii, pp. 177, 522, 523] treated under his

direction at the Cagliari (Sardinia) University from 1933 to 1938, inclusive. Of the total number examined, 63·15 per cent. were due to *Trichophyton violaceum*, 15·3 to *T. plicatile*, 7·61 to *T. crateriforme*, 4·1 to *T. rosaceum*, 4 to *T. glabrum*, 3 to *T. acuminatum*, and 1 to *T. cerebriforme* [ibid., xix, p. 17], the incidence of the other six *T.* spp. being under 1 per cent.; favus (*Achorion*) was present to the extent of 8·3 per cent. *T. album* [ibid., xviii, p. 456], *T. niveum radians*, and *T. granulosum* [*T. mentagrophytes*] are here recorded for the first time for Sardinia.

Grigoraki (L.) & David (R.). **Caractères bio-chimiques de Trichophyton granulosum (Pégus, 1909).** [Biochemical characters of *Trichophyton granulosum* (Pégus, 1909).]—*C.R. Soc. Biol., Paris*, cxxxii, 25, pp. 392–394, 1939.

The systematic position of *Trichophyton granulosum* being very ambiguous, a biochemical study [cf. *R.A.M.*, xviii, p. 678] of the fungus was made with a view to elucidating the situation. Casease was found to be very active in this species, the dissolution of casein beginning on the first day of culture in Sabouraud's medium and being completed at the end of a month. Trypsin was moderately active, but only started to liquefy gelatine when cultures containing 18 per cent. of this substance reached the age of about a month, the process then being accomplished in another 25 days or so. During a period of 30 days the colour of glucose, mannose, and galactose solutions ranged through orange 116 to yellow-green 256, purple-red 591 to yellow-green 253D, and purple-red 591 to red-orange 66 (Klincksieck & Valette), respectively. The development of indol was negligible. These characters differ entirely from those of *T. asteroides* [*T. mentagrophytes*] and other species of the microid group associated with deep-seated folliculitis.

Scarpa (A.). **Favo e favide della cute glabra.** [Favus and favids of the glabrous skin.]—*G. ital. Derm. Sif.*, lxxx, 6, pp. 1103–1117, 1 pl., 1939.

This is a general survey of contemporary studies on the theoretical and practical aspects of favus of the glabrous skin, illustrated by the clinical history of a case of the disorder in a 30-year old woman treated at the Rome University Skin Hospital. The causal organism (*Achorion schoenleini*), originating in the scalp, induced secondary cutaneous reactions in other parts of the body.

Schattenberg (H. J.) & Flinn (M.). **Experimental studies on bronchomoniliasis.**—*Proc. Soc. exp. Biol., N.Y.*, xli, 2, pp. 557–558, 1939.

At the Tulane University School of Medicine, New Orleans, Louisiana, rabbits injected intravenously with cultures of *Monilia* [*Candida*] *albicans* from a case of bronchomycosis [*R.A.M.*, xix, pp. 17, 18] readily developed the pathological symptoms characteristic of the disease in man. Moreover, the histopathological changes in the animals varied according to the period of survival as controlled by the dosage employed and presented far-reaching analogies with the acute and chronic types of the malady as observed in human beings.

Carol (W. L. L.). **Mycosis profunda s. generalisata, veroorzaakt door Candida albicans.** [Deep-seated, generalized mycosis caused by *Candida albicans*.]—*Ned. Tijdschr. Geneesk.*, lxxxiii (ii), 21, pp. 2423–2429, 3 pl. (1 col.), 1939.

Candida albicans, identified by Dr. Diddens, was isolated in Amsterdam from the diseased tissues in a 61-year-old male patient suffering from deep-seated, generalized mycosis [see preceding and next abstracts].

Beatty (O. A.). **Chronic pulmonary moniliasis.**—*Kentucky med. J.*, xxxvii, 7, pp. 269–271, 1939.

A report is given of a case of chronic pulmonary infection due to *Monilia* [*Candida*] *albicans* [see preceding abstracts] in a 44-year-old man at Glasgow, Kentucky, the fungus having repeatedly been cultured from the sputum and the tuberculin test giving negative results.

De Almeida (E.) & Lacaz (C. da S.). **Frequencia das micoses pulmonares en São Paulo.** [The incidence of pulmonary mycoses in São Paulo.]—*Ann. paulist. Med. Cirurg.*, xxxviii, 1, pp. 4–14, 1939. [English summary.]

Of 422 samples of sputum from cases of pulmonary disease examined by the authors from 1935 to 1938, inclusive, 140 (31·1 per cent.) were positive for fungi, including 14 of *Aspergillus*, 12 of *Penicillium*, 2 of *Rhizopus*, and 1 of *Mucor* [cf. *R.A.M.*, xvii, p. 529]. A species of *Penicillium*, probably *P. crustaceum*, was isolated from the bronchial secretions of a female asthmatic patient who was successfully treated by iodide therapy.

Stolow (A. J.). **Primary broncho-pulmonary aspergillosis.**—*J. med. Soc. N.J.*, xxxvi, 8, pp. 484–485, 1939.

A species of *Aspergillus* [see preceding and next abstracts] was isolated in pure culture from the bronchial secretions of a 27-year-old farmer suffering from a pulmonary disorder incorrectly diagnosed as tuberculosis at the State Sanatorium for Tuberculous Diseases, Glen Gardner, New Jersey. The fungus is believed to have been primarily responsible for the trouble and would probably be detected in numerous other cases of doubtful origin by careful bronchoscopic and sputum examination.

Bassi (A.). **Due casi di aspergillosi polmonare ed alcune considerazioni sociali sulle micosi.** [Two cases of pulmonary aspergillosis and some social aspects of mycoses.]—*Settim. med.*, N.S., xxvii, 13, pp. 381–384, 387–390, 393, 5 figs., 1939.

Clinical histories are given of two cases of pseudotubercular disturbance at Piacenza, Italy, one in a 38-year-old farmer and the other in a 32-year-old miller. A species of *Aspergillus* [see preceding abstracts] was isolated in both instances from the sputum and inoculated into laboratory animals with positive results.

Rebouças (J.). **Aspergilose niger do conduto.** [Black aspergillosis of the auditory canal.]—*Rev. brasil. oto-rino-laring.*, vii, 2, pp. 169–172, 1939.

Aspergillus niger was isolated on Sabouraud's medium from the auditory canal [*R.A.M.*, xix, pp. 92] of a 30-year-old woman at São Paulo, Brazil, this being apparently the first record of the fungus for the site in question in the country.

Linck (K.). **Tödliche Meningitis aspergillina beim Menschen.** [Fatal meningitis aspergillina in Man.]—*Virchows Arch.*, ccciv, 3, pp. 408–419, 4 figs., 1939.

Full clinical details are given of a fatal case of leptomeningitis in a 19-year-old youth at Erlangen, Germany. A species of *Aspergillus* was isolated from the pia mater and is regarded as the primary agent of the disease.

Yamamoto (T.). **Über die Mundhöhlenblastomykosis.** [On blastomycosis of the oral cavity.]—*Oto-rhino-laryng.*, xii, 5, pp. 393–402, 1 pl., 9 figs., 1939. [Japanese, with German summary.]

From persistent abscesses in the oral cavity of a 39-year-old female the writer isolated at the Showa School of Medicine, Tokyo, a species of *Myceloblastanon* [*R.A.M.*, xvii, p. 528], the pathogenicity of which was proved by experiments on laboratory animals.

Ruchman (J.). **Rhinosporidiosis (Seeber): first occurrence in a female in North America.**—*Arch. Otolaryng., Chicago*, xxx, 2, pp. 239–246, 2 figs., 1939.

Full clinical details are given of a case of rhinosporidiosis (*Rhinosporidium seeberi*) [*R.A.M.*, xviii, p. 800] in a 33-year-old woman at Brooklyn, New York, stated to be the fifty-sixth report of the disease, the eighth for North America, and the first in a female in that country.

Anderson (W. B.) & Byrnes (T. H.). **A case of Rhinosporidium of the conjunctiva.**—*Amer. J. Ophthal.*, Ser. 3, xxii, 12, pp. 1383–1388, 4 figs., 1939.

A fungus presenting the typical features of *Rhinosporidium seeberi* [see preceding and next abstracts] was detected in 1938 in a polypus on the lower left eyelid of a 12-year-old negro boy at the Duke University Hospital, North Carolina, this being apparently the first record for North America of the fungus in the ocular tissue.

Griffey (E. W.). **Rhinosporidiosis: a case report.**—*Amer. J. Ophthal.*, Ser. 3, xxii, 12, pp. 1389–1390, 1939.

A case of rhinosporidiosis [*Rhinosporidium seeberi*: see preceding abstracts] of the right eye in a ten-year-old boy at Houston, Texas, is reported.

Faber (H. K.), Smith (C. E.), & Dickson (E. C.). **Acute coccidioidomycosis with erythema nodosum in children.**—*J. Pediat.*, xv, 2, pp. 163–171, 1939.

This is a report of 24 cases of acute coccidioidomycosis (*Coccidioides*

immitis), personally studied by the authors in children under 15 years of age in the San Joaquin Valley, California [*R.A.M.*, xix, p. 153]. The illness is accompanied by the development of a marked specific sensitivity to the products of the fungus.

RUDDOCK (J. C.) & HOPE (R. B.). **Coccidioidal peritonitis : diagnosis by peritoneoscopy.**—*J. Amer. med. Ass.*, cxiii, 23, pp. 2054–2055, 1 fig., 1939.

Full clinical details are given of a fatal case of coccidioidal peritonitis (*Coccidioides immitis*) [see preceding abstract] in a 35-year-old male Japanese at Los Angeles, California.

EMPEY (W. A.) & SCOTT (W. J.). **Investigations on chilled beef. Part I. Microbial contamination acquired in the meatworks. Part II. Cooling and storage in the meatworks.**—*Bull. Counc. sci. industr. Res. Aust.* 126, 71 pp., 8 graphs; 129, 68 pp., 7 diags., 16 graphs, 1939.

The writers' extensive studies (in progress since 1932) on the nature, extent, and sources of the microbial contamination of beef during its preparation in several Australian meat-exporting works showed that the percentages of yeast and moulds in the $-1°$ C. populations were higher than those of the corresponding groups at 20°. Of the organisms viable at $-1°$, yeasts were represented by *Mycotorula, Candida, Geotrichoides, Blastodendrion,* and *Rhodotorula,* while the most prevalent mould was *Penicillium,* followed in the order named by *Mucor, Cladosporium, Alternaria, Sporotrichum,* and *Thamnidium* [*R.A.M.*, xviii, p. 255; xix, p. 152]. The extent of contamination of the meat at the conclusion of dressing operations was reduced to about 5 per cent. of its former level by the introduction of hygienic methods. Of the microflora acquired by the beef prior to the initiation of cooling, only the bacteria undergo appreciable changes during this process.

CHAUDHURI (H.). **On resistance of vernalised plants of Linseed to attack by Melampsora lini.**—*Curr. Sci.*, viii, 12, pp. 555–556, 1939.

In experiments conducted by G. Singh linseed seeds T_5 and T_{10} from Lyallpur were given pre-sowing cold treatment and grown in small plots contiguous to the linseed varieties E.B.Z. and O.S.X. from Nagpur. The last two were attacked by *Melampsora lini* [*R.A.M.*, xviii, p. 679] early in March, infection spreading to the untreated T_{10} controls and, a few days later, to the untreated T_5 controls. The treated plants were the last to become affected, and of these, those treated for the longest period (2 weeks, as against $1\frac{1}{2}$ weeks and 1 week in the case of the remainder) showed little or no infection.

MULLER (H. R. A.) & VAN EEK (T.). **Aanteekeningen over eenige ziekten van Roselle en Java-Jute op Java.** [Notes on some diseases of Roselle and Java Jute in Java.]—*Meded. alg. Proefst. Landb., Batavia,* 32 (*Meded. Inst. PlZiekt., Buitenz.*, 92), 21 pp., 1939. [English summary.]

Roselle (*Hibiscus sabdariffa*) and Java jute (*H. cannabinus*) are subject in Java to infection by two groups of fungi, one causing foot rots and the other stem and leaf diseases, the former being the more

important of the two. Included in the foot rot category are *Pythium perniciosum* [*R.A.M.*, x, p. 346], *Rhizoctonia* [*Corticium*] *solani*, *Sclerotium rolfsii* [ibid., xi, p. 158], and *Phytophthora parasitica* [ibid., xiii, p. 216], of which the last-named is the most troublesome, causing losses of 20 per cent. or more, especially on the green-stemmed varieties of *H. sabdariffa*. It produces a black basal rot, gradually merging into the sound tissue by way of an ill-defined water-soaked zone, and extending upwards for a height of 30 to 35 cm. or up to 1 m. above ground-level. In both these respects the *Phytophthora* rot differs from those due to *C. solani* and *S. rolfsii*, the discolorations induced by which are sharply differentiated from the healthy areas and the height attained by the decay not exceeding 5 cm. Older lesions of *P. parasitica* harbour a rich secondary mycoflora, among which *Fusarium* spp. of the *F.* [*solani* var.] *martii* group predominate. Occasionally in loose, sandy soils the roots may also be attacked by *P. parasitica*, which has further been observed to cause local infections high up on the stem, resulting in unilateral wilting in contrast to the general die-back of the upper portions of the plant following invasion of the stem base or root system. These local infections may proceed either from the lower leaves, which are frequently spattered with spores from the soil during rainy periods, or from contact with diseased plants in plantings where prompt eradication is not practised. Cases have been observed in which one diseased plant contaminated five to twelve adjacent healthy ones. Prophylactic measures should include stringent soil sanitation; the substitution of the relatively resistant *H. cannabinus* for *H. sabdariffa*, especially on foci of previous infection and round inlets of irrigation water where silt (frequently contaminated) is deposited; and arrangements for the gradual infiltration of the irrigation water through trenches on to the plant beds so as to avoid immediate contact with a possible source of infection. Direct control should comprise the early decapitation of infected plants some 10 cm. above the discoloured stem area and the removal of the tops, strewing the stumps with freshly slaked lime and after the harvest uprooting and burning, and soil disinfection with 0·1 per cent. terbolan [ibid., xviii, p. 794]. Diseased stems should be picked out before the crop is retted to avoid contamination of the irrigation water. Unlike the other three agents of root rot, *P. parasitica* is not suppressed to any extent by antagonistic micro-organisms, the mortality percentages in inoculation experiments in sterilized and unsterilized soils being 34·8 and 36·4, respectively, while the corresponding figures for *Pythium perniciosum* were 100 and 38·5 (30·5 in one test), respectively. For the control of the latter organism disinfection with 0·3 per cent. ceresan (5 l. per sq. m.) is recommended. *C. solani* and *S. rolfsii* are both favoured by dry weather with heavy dew formation, their development being restricted under normally humid conditions by the competition of other soil organisms. Direct control is seldom necessary in the case of these two foot rots, but sporadic outbreaks of *C. solani* may be combated by spraying with 1·5 per cent. Bordeaux mixture. Slime disease (*Pseudomonas* [*Bacterium*] *solanacearum*) has not been personally observed by the writers either on rosette or Java jute, both of which, however, have been recorded as hosts of the pathogen in Java and Sumatra by other workers [ibid., vi, pp. 131, 419].

No great economic importance need be attached to the stem and leaf diseases of *H. sabdariffa* and *H. cannabinus* in Java. *Phoma sabdariffae* and *Cylindrocladium scoparium* [ibid., xvi, pp. 209, 756] cause foliar spotting, sometimes accompanied by top rot, while local necrotic lesions on the stem cortex are produced by *F. sarcochroum* [ibid., xi, p. 30] and *Diplodia* sp. *H. sabdariffa* appears to be much more susceptible than *H. cannabinus* to attack by the *F.* spp., the injuries due to which may under certain conditions extend into unilateral cankers 5 cm. in length. After retting these dark blotches remain visible on the fibres to which bark remnants adhere, thereby impairing the commercial value of the product.

MACFARLANE (CHRISTINA S.). **A rot of Scilla bulbs caused by Penicillium cyclopium Westling.**—*Trans. bot. Soc. Edinb.*, xxxii, 4, pp. 542–547, [1939].

In January, 1938, bulbs of *Scilla campanulata* var. *albida* received in Edinburgh from Holland were found to be rotted, in some cases so badly that growth was impossible; isolations yielded a species of *Penicillium* producing an earthy odour in culture and forming round conidia, 2·9 to 4·1 (average 3·46) μ in diameter, borne in compact chains. The fungus was thought to be *P. cyclopium* Westling [cf. *R.A.M.*, xvi, p. 538], and this identification was confirmed at Baarn, though Westling's fungus had smaller spores (2·6 to 3·2 μ) and seldom emitted the strong earthy odour. Thom (1930), however, refers to a culture received from Biourge and confirmed as *P. cyclopium*, in which this smell was observed.

Infection experiments with bulbs of *S. campanulata* and *S. nutans* demonstrated that infection depended on the presence of a wound, while only one infection occurred in the absence of external moisture and this was short-lived. It is concluded that moisture is necessary for the fungus to establish itself permanently, and high temperature and contact between bulbs are also predisposing factors for attack.

MOORE (W. C.). **New and interesting plant diseases. 3. A shoot wilt of Prunus triloba caused by Botrytis cinerea Pers.**—*Trans. Brit. mycol. Soc.*, xxiii, 4, pp. 313–315, 2 pl., 1939.

During the spring of 1936 a few shoots on a *Prunus triloba* var. *floro pleno* bush at Harpenden suddenly wilted after flowering, and it was observed that some of the decaying flower clusters were covered with the fructifications of a *Botrytis*. The one-year-old flowering shoots were mainly affected, but new ones were also attacked. In the flowering shoots the condition was almost always associated with a faded, dying flower or flower cluster, which was generally covered with *Botrytis* fructifications. The bark above and below the bud bearing these flowers was somewhat sunken for a distance of 2 to 3 in. and darker than the surrounding healthy parts. Occasionally the disease had originated at the spot where a stray, wind-blown petal had adhered to an internode of a one-year-old twig. The current season's shoots appeared to be directly attacked at or near the base. The wilted leaves became brown and dry and remained attached to the dead shoots through the season. The disease recurred in 1937 and again in 1939. Isolations in both these

years yielded a *Botrytis* of the *cinerea* group. Inoculations of current season's and second-year shoots through wounds gave rise to typical symptoms in three and seven days, respectively, the fungus being re-isolated from the infected parts.

Two cases of *Botrytis* infection of the stems of *Daphne mezereum* and *Cotoneaster frigida* are also reported.

PAPE (H.). **Achtung auf den Begonienmehltau!** [Beware of Begonia mildew!]—*Blumen- u. PflBau ver. Gartenwelt*, xliii, 48, p. 522, 1 fig., 1939.

True mildew of begonias (*Oidium begoniae*) is stated to be spreading in Germany [*R.A.M.*, xv, p. 443] since its first appearance in 1934, both the Lorraine and Elatior types being affected. According to Danish observations [ibid., xii, p. 448] the disease is most prevalent during the short, dark days of December and January. So far the writer has noticed no cases of virulent infection, but reports from Holland [ibid., xvi, p. 299] describe severe damage from shrivelling of the foliage, arrested growth, and failure of flower production. Repeated applications of finely ground sulphur dust, lime-sulphur, lye sulphur (e.g., sulphur mixture 1034), solbar, or colloidal sulphur should give effective control if commenced immediately on the outbreak of infection, all very badly attacked plants being promptly removed and burnt.

ZEROVA (MME M.). **Coniothyrium cheiranthi sp. nov.** на **Cheiranthus cheiri L.** [*Coniothyrium cheiranthi* n. sp. on *Cheiranthus cheiri* L.].—*J. Inst. Bot. Acad. Sci. Ukraine, 1939*, 21–22 (29–30), pp. 337–338, 2 figs., 1939. [English summary.]

A description [with a Latin diagnosis] is given of *Coniothyrium cheiranthi* n. sp., isolated from necrotic tissues of wallflower leaves and stems from the gardens of a communal farm at Kamenetz-Podolsk, where it was first observed on a few plants in 1937, becoming very prevalent in the following year. The first symptom of the disease is foliar wilting. Later on extensive brownish-grey lesions with a darker margin develop on the stems and on both sides of the leaves; the entire plant may be stunted, the upper leaves deformed and rolled, and the buds under-developed. Sometimes the plant is ultimately killed. Mature pycnidia developed after 15 days on beer wort agar and the inoculation of healthy leaves with pycnospores gave positive results.

The pycnidia of the fungus are solitary, sometimes in groups of two or three, at first brownish, rounded, with a pointed apex, and immersed, later on black, appressed-round with a depressed apex, semi-immersed, 272–400–430 μ in diameter, with a round ostiole, 32 to 40 μ; the pycnospores are unicellular, ovate, oval, cylindrical, straight, or sometimes asymmetrical, fumaceous, and measure 2·5 to 5 (rarely 6·8) by 1·5 to 2·3 μ.

ZEROVA (MME M.). Антракноз **Ligustrum vulgare L.** в УРСР. [Anthracnose on *Ligustrum vulgare* L. in the Ukrainian S.S.R.]—*J. Inst. Bot. Acad. Sci. Ukraine, 1939*, 21–22 (29–30), pp. 325–332, 5 figs., 1939. [English summary.]

A serious disease of privet was observed during 1938 causing die-

back of 60 to 70 or up to 100 per cent. of seedlings and two- to three-year-old plants in two nurseries near Kieff. The plants wilt rapidly, the leaves usually turning yellow and then brown, but in dry, hot weather the leaves wither when still green. Brown, round spots, sometimes with a definite margin, often appear on both sides of the leaf blade. The fungus causing the disease was identified as *Colletotrichum gloeosporioides* [the conidial stage of *Glomerella cingulata*: *R.A.M.*, ix, p. 654]. The fructifications of the fungus were observed in many instances to give rise to pycnidia of the *Phoma* type, and this stage is regarded as a new fungus and named *P. lavitskii* n. sp. [with a Latin diagnosis]. It is characterized by semi-immersed, subglobose, black pycnidia, 120 to 175 μ in diameter, sometimes provided with brown setae and a rounded ostiole, and ellipsoid or ovoid conidia, measuring 3·5 to 5·1 by 2·2 to 2·5 μ.

METCALFE (G.). **A bacterial disease of Forsythia.**—*Nature, Lond.*, cxliv, 3660, p. 1050, 1939.

The two-year-old branches of *Forsythia spectabilis* and *F. intermedia* in an East Anglian nursery were found on examination at the Botany School, Cambridge, to be suffering from a disease causing partial or complete failure of the flowers, the buds either remaining dormant or opening imperfectly. Sections through the apparently healthy shoots revealed a scarlet to dark brown, usually crescent-shaped stain in the wood. On any bush, healthy and diseased shoots arise from different stools. Excision of the infected branches (but not of the diseased stools) failed to control the die-back, indicating that the pathogen can spread from diseased to sound stools. The green-fluorescent bacterium isolated on beef infusion agar and Uschinsky's solution from the discoloured wood was found to be closely related to *Pseudomonas syringae*, previously reported by Wormald as probably causing a disease on the same host [*R.A.M.*, xv, p. 703]. Inoculation experiments on young, succulent lilac [ibid., xviii, p. 257] and *Forsythia* shoots gave positive results.

PRETI (G.). **L''Oidium acrocladum' Ferr. riscontrato sulle diverse specie di 'Stapelia' coltivate nella riviera ligure occidentale.** [*Oidium acrocladum* Ferr. found on various species of *Stapelia* cultivated on the western Ligurian Riviera.]—*Riv. Pat. veg.*, xxix, 9–10, pp. 423–427, 2 figs., 1939.

In June, 1937, the author observed that *Stapelia variegata*, *S. grandiflora*, *S. bergeriana*, *S. gigantea*, *S. viscolor*, *S. hirsuta*, *S. longipedicellata* var. *kwebensis* [*S. longipedicellata*], *S. nobilis*, and *S. mutabilis* growing in a cold greenhouse in San Remo showed the presence of a fungus identical with *Oidium acrocladum* [*R.A.M.*, xvii, p. 324] on the extremities of the branches. The evidence indicated that infection is favoured by hot, wet conditions and lack of direct sunlight. Plants showing early infection recovered after being placed in the sun and kept without being watered. It is recommended that badly affected plants should be removed, the remainder placed in the sun, and the greenhouse thoroughly ventilated. Sulphur is also stated to be effective against the fungus.

SAMPSON (KATHLEEN). **Additional notes on the systemic infection of Lolium.**—*Trans. Brit. mycol. Soc.*, xxiii, 4, pp. 316–319, 1939.

Continuing her studies on the endophytic fungus of *Lolium* spp. [*R.A.M.*, xvii, p. 251], the author observed mycelium in *Festulolium loliaceum* (Huds.) Hubbard (syn. *Festuca loliacea*). Systemic infection of this plant, of which this is the first record, is in conformity with its supposed origin as a natural hybrid between *F. pratensis* and *L. perenne*.

A number of fresh isolations were made from plants of *L. perenne* of different origin, but these and the isolates from the hybrid remained sterile, like the original types, providing no further clue to the identity of the fungus or fungi concerned. The distinguishing features of the two types of mycelium isolated from *L. perenne* (endophytes 1 and 2) [loc. cit.] are tabulated.

Cultures from *Festulolium loliaceum* fell into two groups, those from Middlesex and Montgomeryshire resembling endophyte 1, and those from Oxfordshire and Wiltshire agreeing with endophyte 2. In one instance, the mycelium in a large piece of pith from a plant from Montgomeryshire gave appreciable growth on agar, the fungus being isolated when transfer was made to egg. This is the only occasion when endophyte 1 has been isolated when pith was placed directly on an agar medium. In the plants from Oxfordshire and Wiltshire, the mycelium in the pith was sparsely branched and deeply staining, like that of endophyte 1 in perennial rye grass No. 1971. The distribution of mycelium in the most mature ovaries agreed with that in perennial rye grass No. 1971, darnel, and related species.

Of 42 plants of *L. perenne* only five were systematically infected, the endophyte being isolated from each. Two plants from Aberystwyth and Norfolk carried endophyte 1 and one plant from Lincolnshire contained endophyte 2. Two other plants from Lincolnshire and Norfolk carried mycelium in the stems and seed resembling endophyte 1, these strains corresponding with those found in *F. loliaceum* from Oxfordshire and Wiltshire.

The mycelium in *L. multiflorum* failed to grow on artificial media, agreeing in this and other respects with that found in *L. temulentum* and *L. remotum*.

CROSIER (W.). **Occurrence and longevity of Ascochyta pisi in seeds of Hairy Vetch.**—*J. agric. Res.*, lix, 9, pp. 683–697, 4 figs., 1939.

In studies carried out at Geneva, New York, 181 seed samples of hairy vetch (*Vicia villosa*) imported in 1929 and 1930 and 110 samples imported in 1931 and 1932 yielded *Ascochyta pisi* [*R.A.M.*, xvii, p. 15] in 1 and 16 samples, respectively, on culturing in 1934. When a total of 224 samples of both American and imported crops of 1931 to 1937, inclusive, were tested immediately after their receipt, 149 of the samples were found to be infected internally, but during storage in a warm, dry laboratory for one to five years the number of infected samples decreased continuously, the fungus apparently losing its viability in heated storage within four or five years (very rarely six or seven). The viability of the seed, on the other hand, remained nearly constant for four years or more, thus suggesting prolonged storage as a means of controlling the fungus. Seeds are infected through the pods and disease-

free seeds can be obtained by pod selection; on the other hand, the presence of pod spots does not always indicate that the seeds are infected, only 5·1 per cent. of the seeds of commercial size from pods with lesions being found to contain *A. pisi.* The fungus may permeate all parts of severely infected seeds, but is most usually limited to the seed coat and cotyledons. Exposure to hot air and water was more dangerous to seeds than to either the spores or mycelium of the fungus. New ceresan alone of all the chemicals tested reduced, but did not eliminate, the fungus content in seeds during a two-year storage period. Other fungi isolated, although infrequently, from seeds of *V. villosa* were *Alternaria* sp., *Fusarium* spp. [ibid., xviii, p. 831], *Rhizoctonia* [*Corticium*] *solani* [loc. cit.], and *Xylaria* sp. *A. pisi* was found in a few samples of several species of *Vicia*, but was not recovered from any of 21 seed stocks of *V. sativa*.

REICHERT (I.). **Palestine: diseases of fruiting plants (except Citrus).**—*Int. Bull. Pl. Prot.*, xiii, 12, pp. 277–293, 1939.

A preliminary list is given of the fungal, bacterial, virus, and physiological diseases occurring on fruit plants other than citrus in Palestine, and studied at the Rehovoth Agricultural Research Station, Palestine, from 1923 to 1938 [cf. *R.A.M.*, xviii, p. 518; xix, pp. 73, 134].

HILDEBRAND (E. M.). **Fire blight and its control.**—*Ext. Bull. Cornell agric. Exp. Sta.* 405, 32 pp., 23 figs., 1939.

A popular account is given of the symptoms, causal organism, manner of spread, and control of fireblight disease (*Erwinia amylovora*) of fruit trees [*R.A.M.*, xviii, pp. 685, 725, 786] in New York.

TILLER (L. W.) & COOPER (E. R.). **X-ray detection of mouldy-core in the Delicious Apple.**—*N.Z. J. Sci. Tech.*, xxiA, 3, pp. 168–169, 1 fig., 1939.

An acute recurrence of mouldy core of Delicious apples in the Auckland district of New Zealand [*R.A.M.*, xviii, p. 687] during the 1936 season, reducing the potential export from 30,000 to under 5,000 bush., prompted an investigation of the possibilities of detecting the trouble by means of X-rays. The results of a series of observations with X-rays generated at 6·5 ma. and 75 kv. showed that the average time for the inspection of twelve apples could not be reduced to much below three minutes, at which rate the number of errors made was of the order of 20 per cent., chiefly in the mildly affected fruit. Considering that the cost of a commercial X-ray unit (ten of which would be required for the Auckland district) is in the region of £1,000 and that it would be necessary to work at full pressure for a month at three times the speed indicated above in order to handle 30,000 cases, the irradiation method can scarcely be regarded as commercially practicable.

MÜLLER (J. A.). **Über im Tauchverfahren zwecks Verlängerung der Lagerdauer behandelte Äpfel. Bestimmung der von der Apfeloberfläche abwaschbaren Anteile.** [On Apples treated by the immersion process for the prolongation of the storage period. Determination of the proportions liable to be washed off the skin.]—*Vorratspflege u. LebensmittForsch.*, ii, 11–12, pp. 685–693, 1939.

The amounts of the three mineral oils 2243, 2252, and 2253, recently

used in experiments in Germany in the preservation of apples during cold storage [primarily against *Gloeosporium album*: *R.A.M.*, xviii, p. 533], adhering to the fruit after washing were found in experiments at the Hygienic Institute of Halle University to be too minute to possess any physiological or pharmacological significance.

PERLBERGER (J.). **Entomosporium maculatum on Pears.**—*Palest. J. Bot.*, R Ser., ii, 2, pp. 289–291, 1 fig., 1939.

Attention is drawn to the appearance of *Entomosporium maculatum*, the conidial stage of *Fabraea maculata* [*R.A.M.*, xix, p. 30], in the spring of 1939 in four pear nurseries in northern Palestine. All the diseased trees originated in the Government nurseries at Acre and were grafted on *Pyrus syriaca* stocks.

KIENHOLZ (J[ESS] R.). **Comparative study of the Apple anthracnose and perennial canker fungi.**—*J. agric. Res.*, lix, 9, pp. 635–665, 9 figs., 1 map, 1939.

The results of comparative morphological and physiological studies of the closely related fungi, *Neofabraea malicorticis* [*R.A.M.*, xviii, p. 532] and *Gloeosporium perennans* [ibid., xviii, p. 762], causing apple anthracnose and perennial canker, respectively [cf. ibid., xii, p. 299], failed to show a constant specific distinction between the two species, although the cankers produced by them are quite distinct. Anthracnose occurs generally in the humid regions to the west of the Cascade Range, and perennial canker is found in the dry zones to the east; both diseases occur in certain overlapping areas, and conidia collected there are of an intermediate type. In artificial inoculations a great number of hosts were equally susceptible to both fungi. On standard cultural media greater variations often occurred between the different strains of a species than between the species themselves. The addition of copper sulphate (in concentrations of 0·05 and 0·1 per cent.) to the media reduced the growth of most strains of *G. perennans* to a greater degree than that of *N. malicorticis*; in the orchard, on the other hand, copper sprays effectively controlled the anthracnose fungus but had little effect upon the perennial canker. Both fungi produced sectors in culture.

The results of parallel inoculations with parent and mutant strains strongly suggest that the two diseases are caused by strains of a single fungus that might have arisen by mutation. Conidia produced by either fungus in artificially infected apple fruits were of the perennial canker type. During 1928 and 1929 J. S. Cooley observed an Ascomycetous fungus which proved to be the apothecial stage of *G. perennans*. The present author, in 1932, found apothecia on artificially-induced cankers of *G. perennans* and accordingly names the fungus *N. perennans* [with diagnoses in Latin and English]. It differs from *N. malicorticis* in having slightly smaller asci and ascospores and mostly straight or slightly curved conidia. The asci measured 8·5 to 19·5 by 50 to 142 (mean 12·6 by 98·1) μ, the ascospores 4·2 to 8·5 by 11·5 to 22·7 (mean 6 by 17·7) μ, and the conidia 3 to 6 by 12 to 25 μ. The separation of these fungi into two species is based chiefly on their pathological differences.

LEISHMAN (E.). **Brown rot (Sclerotinia fructicola) of stone fruit.**—*J. Dep. Agric. S. Aust.*, xliii, 3, pp. 196–201, 6 figs., 1939.

Brown rot of stone fruits (*Sclerotinia fructicola*) is stated to have been of little economic importance in South Australia until 1936–7, when apricots in the south-east and cherries in the Mount Lofty Ranges were attacked, the latter in a very severe form entailing heavy losses of fruit. In control experiments on four plots of five trees each of the William's Favourite, Beauchamp's Black, and St. Margaret cherry varieties showing 10, 5 to 10, and 15 per cent. blossom blight, respectively, the best results were given by a schedule comprising one application of Bordeaux mixture (6–4–40) on 14th August (given to all the trees) and two of lime-sulphur (1 in 80), one on 14th October and the second on 1st November, which completely eliminated infection. The other schedules, involving the omission of the second, the first, and both lime-sulphur treatments, respectively, were less successful (the first only slightly so), with 0·8, 2·2, and 6·8 per cent. brown rot, respectively [cf. *R.A.M.*, xviii, p. 785]. The first programme, supplemented by stringent orchard sanitation, is accordingly recommended for the control of the disease on cherries. No tests have yet been carried out on apricots.

HULL (R.). **Study of Byssochlamys fulva and control measures in processed fruit.**—*Ann. appl. Biol.*, xxvi, 4, pp. 800–822, 2 graphs, 1939.

From the survey of various fruit-producing areas in England it is concluded that *Byssochlamys fulva* [*R.A.M.*, xix, p. 24] develops in the field on fruit refuse, particularly on mummified plums, during the summer months, the ascospores being later disseminated by air. Under laboratory conditions the majority of ascospores did not survive a short exposure to 85° C., and at 96° all spores were killed within 9 minutes. Conidia were killed after heating for 10 minutes at 70°. The optimum temperature, both for mycelial growth and for ascospore germination, was about 35°. The germination of ascospores was stimulated by previous heating to about 70°, and ascospores pre-heated for 20 minutes at 75° germinated more rapidly on agar plates with a sucrose concentration of 20 per cent. than on plates with either 0 or 40 per cent. sucrose. The asci were relatively insensitive to fungicides and to concentrations of carbon dioxide below 60 per cent. A pectin-destroying enzyme extracted from the mycelium of the fungus was found to cause a rapid distintegration of the tissue of canned fruits. In canning experiments with naturally infected fruit the infection was controlled by heating the contents to 195° F. The amount of mycelial growth in an infected can was greater with increasing head space.

STOUT (G. L.). **Peach mosaic.**—*Bull. Dep. Agric. Calif.*, xxviii, 3, pp. 117–200, 10 figs., 1939.

In this paper the author gives a full account in semi-popular terms of the history, symptoms, transmission, spread, and control of peach mosaic [*R.A.M.*, xvi, p. 543; xviii, pp. 78, 260], based partly on the available literature and partly on the results of three seasons' intensive field work in southern California. The following items may be noted.

Different peach varieties show marked dissimilarity in severity and type of symptom expression. Rio Oso Gem and Fay Elberta exhibit all five known groups of symptoms, viz., colour-breaking, retarded foliage development, leaf mottle and deformity, fruit deformity, and abnormal twig growth; Hale and Elberta show all except colour-breaking, while Florence and Mayflower present pronounced blossom symptoms, but show others mildly. All varieties produce leaf symptoms, but individual trees may fail to show definite symptoms during the growing season. In the dormant season the disease is recognizable in the field only on those varieties showing marked twig abnormalities. Affected petals are sometimes crinkled and dwarfed. Foliage retardation may persist into summer. Many of the first leaves drop when severely affected, and later ones may appear more normal. In California, veinlet-clearing is sometimes very pronounced throughout individual trees of a few varieties, but as it tends to disappear rapidly it is useful as a diagnostic symptom chiefly very early in the season. The yellow markings may be closely associated with the midrib or lateral veins. Very often a feathery, elongated, irregular yellow band is visible along a vein. Affected fruits may ripen more than a week after normal ones. So far the disease has only been transmitted by budding or grafting but unknown insect vectors may be responsible for its rapid natural spread.

During 1938, approximately 18,000 new infections were found in southern California, this figure amounting to about one-half that for 1937 [ibid., xvii, p. 798]. Between the beginning of the eradication campaign in 1936 and February 1939, approximately 81,000 diseased trees were found, of which nearly 63 per cent. were removed. Some 200,000 abandoned peaches, including 20,000 abandoned nursery trees, have also been removed.

BOYD (O. C.). **Distribution of X-disease of Peaches in Massachusetts.**—*Plant Dis. Reptr*, xxiii, 21, pp. 341–342, 1939. [Mimeographed.]

Details are given of the prevalence of the X-disease (yellow-red virosis) of peach and chokecherry (*Prunus virginiana*) [*R.A.M.*, xviii, p. 401] in Massachusetts in 1939. In general, the disorder was much more widespread in the southern than in the northern half of the State. The actual and potential gravity of the situation is emphasized.

MEREDITH (C. H.) & BUTLER (A. F.). **The production of Cercospora musae conidia in Banana-leaf agar.**—*J. Jamaica agric. Soc.*, xliii, 12, p. 621, 1939.

Conidia of *Cercospora musae* were obtained in culture on banana leaf extract agar, using water distilled in pyrex glassware, no copper being allowed to come in contact with the medium. The conidia for seeding were taken directly from infected leaves kept in moist conditions for 15 to 20 hours.

ZILLIG [H.] & EHRKE [G.]. **Gerät zur Spritzbrühenbereitung nach System Willmes-Kreutzenberger und Spritzbrühenmischanlage mit Zapfhaus, Bauart Willmes der Firma Josef Willmes, Mannheim, Kaiserring 38 (Einzelprüfung).** [Spray preparation equipment on

the Willmes-Kreutzenberger lines and spray-mixing depots with 'pivot house', construction by Willmes of the firm Josef Willmes, Mannheim, Kaiserring 38 (First trial).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), iv, 12, pp. 103–104, 2 figs., 1 diag., 1939.

Full details are given of the construction and application of the 'Mix' apparatus for the preparation on behalf of co-operative concerns of Bordeaux mixture and other fungicides used in the vineyard.

SCHMIDT (H.). **Gemeinschaftliche Spritzbrühmischanlagen.** [Co-operative spray-mixing depots.]—*Obst- u. Gemüseb.*, lxxxv, 11, pp. 118–119, 1 fig., 1 diag., 1939.

Particulars are given of the co-operative spray-mixing depots in course of erection or already completed in the viticultural and fruit-growing regions of Germany. The fungicides are supplied to the growers at cost price; in 1938 the total amount used at Meckenheim (Palatinate) was 800,000 l. and in 1939 (until the autumn) over 1,000,000 l., sufficient to cover the 150 hect. of vineyard and 55,000 fruit trees within the parish bounds. The Willmes 'Mix' apparatus [see preceding abstract] is also applicable for similar purposes on a smaller scale.

HAYDEN (J.). **A home-made spraying mask.**—*Agric. Gaz. N.S.W.*, l, 12, p. 678, 1 fig., 1939.

A cheap, simple, and effective mask to protect the face from irritating sprays is described, consisting of a straw hat to the rim of which is sewn a veil about 12 in. deep made of blind holland or other waterproof material, with a cut about 6 by 8 in. in front into which is sewn a piece of celluloid.

DICKSON (J. G.). **Outline of diseases of cereal and forage crop plants of the northern part of the United States.**—vii+259 pp., Burgess Publishing Company, Minneapolis, Minn., 1939. [Mimeoprinted.] $3.

This outline of diseases of cereals and forage crop plants in the northern areas of the United States aims at presenting the more important relevant information in a convenient form and is not intended to be a complete treatise on the diseases in question. The diseases are grouped under the hosts concerned, viz., barley, maize, oats, rye, sorghum and millet, wheat, flax, lucerne and sweet clover, clovers, and soy-bean. The notes deal with such matters as hosts, geographical distribution, economic importance, symptoms, pathological histology, causal organism, and control. Bibliographical references are given for each disease and total over 2,500 items.

HOLMES (F. O.) **Handbook of phytopathogenic viruses.**—vii+221 pp., Minneapolis, Minn., Burgess Publishing Company. [Mimeoprinted.] $2.

In this useful publication the author has collected together and condensed the essential information regarding 129 plant viruses, which he here discusses under their common and new Latin binomial names as

a more detailed illustration of his proposed system for the classification and nomenclature of viruses [*R.A.M.*, xviii, p. 607]. The data for each virus are summarized under the following headings: synonyms, susceptible and insusceptible species, geographical distribution, induced disease [symptoms], transmission, serological and immunological relationships, thermal inactivation, filterability, other properties, and control. Select bibliographies are appended. The book concludes with particulars of certain bacteriophages, fairly complete lists of plants susceptible to the viruses of aster yellows, beet curly top, tobacco mosaic, cucumber mosaic (cucumber virus 1), and tomato spotted wilt, a list of 51 viruses still inadequately described, and an index.

WATSON (M[ARION] A.) & ROBERTS (F. M.). **A comparative study of the transmission of Hyoscyamus virus 3, Potato virus Y, and Cucumber virus 1 by the vectors Myzus persicae (Sulz), M. circumflexus (Buckton), and Macrosiphum gei (Koch).**—*Proc. roy. Soc.*, Ser. B, cxxvii, 849, pp. 543–576, 1 pl., 1939.

The results given in this paper support the previously proposed hypothesis [*R.A.M.*, xvii, p. 344] that one of the main factors in the complex relationship between the non-persistent viruses and their vectors is the inactivation of the viruses by a substance produced by the vectors when feeding. The efficiency of the three vectors used, viz., *Myzus persicae*, *M. circumflexus*, and *Macrosiphum gei* [*M. solanifolii*], in transmitting all the viruses tested (three strains of *Hyoscyamus* virus 3, two of cucumber virus 1, and potato virus Y) was shown to increase with increasing time of fasting before feeding on the infected plants, and to decrease as the time of feeding on the infected plants was prolonged. The substance which is thought to inactivate the virus appears to be produced by all the vectors, though in varying quantities, and all the viruses tested seemed to be affected in a similar manner. On the whole the most efficient vector was *M. persicae* and *M. solanifolii* the least so, but their relative efficiency varied with the different viruses, being apparently influenced, apart from the infectivity of the virus, by the concentration and the localization of a given virus in the host plant, and the capacity of the vector for inactivating the virus.

Since the three viruses thus shown to have similar insect-virus relationships are also similar in many of their physical properties, it is suggested that such viruses may form a natural group, with the same type of vector-virus relationship. The opinion is expressed that mechanical transmission of these viruses by insects is very unlikely, judging by the foregoing results.

WEISS (F.). **A key to the typical viruses of leguminous crops.**—*Plant Dis. Reptr*, xxiii, 22, pp. 352–361, 1939. [Mimeographed.]

In presenting this annotated key to some typical virus diseases of leguminous crops the author states that if K. M. Smith's book on plant virus diseases [*R.A.M.*, xvii, p. 52] could be accepted by international agreement as a basis for virus nomenclature, the appropriate 'generic' reallocations, transfers to synonymy, and additions of new names would present no insuperable difficulties, but even tentative agreement on virus names seems unlikely in the near future [cf. ibid., xviii,

pp. 606, 607]. Pending the adoption of international rules of nomenclature for plant viruses, and in order to systematize the records, the Plant Disease Survey is preparing an index of viruses and virus diseases occurring in the United States, and the present paper is the first of a series of studies projected to this end. As a tentative basis, Smith's system of classification and nomenclature is being followed, but with variations agreed upon by the Survey staff and the virus specialists consulted. It is hoped to build up a system of virus nomenclature that may prove widely acceptable as a standard in the United States, making broad provision for synonyms and common names and for elasticity of revision.

The principles followed are these: the formal virus name is to consist of (*a*) the Latin generic name of the first described or the most important host, (*b*) an Arabic numeral indicating its chronological order in the discovery and formal description of the viruses especially affecting this host, and (*c*) the name of the author of the type description, e.g., *Phaseolus* virus 2, Pierce.

Notes are given on the interpretation of the key (which covers beans, peas, clovers, and lucerne), and the paper concludes with a bibliography of 29 titles.

HARLEY (J. L.) **Beech mycorrhiza: reisolation and the effect of root extracts upon Mycelium radicis fagi (Chan).**—*New Phytol.*, xxxviii, 4, pp. 352–363, 1 fig., 1 diag., 3 graphs, 1939.

In continuation of his studies on beech mycorrhiza [*R.A.M.*, xvii, p. 54] the author isolated from the 'pyramidal' type of infection [loc. cit.] a fungus closely resembling *Mycelium radicis fagi* [ibid., ii, p. 463]. In view of the difficulty of obtaining pure cultures of the fungus a special technique was used, by which the infected roots were first washed with sterile distilled water and then placed in a washing apparatus of original design, where they were immersed for 30 seconds in 10 per cent. bromine water and then shaken by a motor apparatus in a continuous current of distilled sterile water for several hours. Several pure or nearly pure cultures have thus been obtained. The growth in pure culture was strikingly slow, the fungus was incapable of attacking amide or amino nitrogen with any readiness, and the rate of respiration as measured by carbon dioxide emission was very low. The growth was stimulated, however, by the addition of extracts of beech roots, which were found to be a mixture of substances containing, very probably, a catechol tannin and oxidase enzyme system and very little nitrogen and carbon, the stimulation amounting in various sets of experiments to from 400 to 800 per cent. The stimulating property of the extract was not destroyed by heat or kaolin. Since the contents of nitrogen and carbon in the extract are very small, it is believed that the extract does not act as a source of nutriment, but provides some form of relatively heat-stable accessory food factor. Experiments on reinfection of beech with the organism are in progress.

BURGES (A.). **The defensive mechanism in Orchid mycorrhiza.**—*New Phytol.*, xxviii, 3, pp. 273–283, 1 pl., 1 fig., 1939.

The invasion of orchids by mycorrhizal fungi [*R.A.M.*, xvi, p. 446]

takes place through root hairs or more rarely by direct penetration of the epidermis, the latter being the most common method in *Gymnadenia conopsea.* Hyphae invade the middle cortex, but they are, however, soon destroyed by a defensive mechanism of the plant, which seems to operate more actively in the tubers, stems, and leaves than in the roots, to which the fungal infection is usually limited. Two types of resistance can be distinguished, a mechanical, in which the cell walls become thickened (by a layer up to 6 or 7 μ thick) and turn yellow, undergoing probably some form of excessive cuticularization; and a protoplasmic resistance, in which the invading hyphae are completely broken down by what appears to be the action of proteolytic enzymes, to a more or less homogeneous yellowish mass in the centre of the host cell. When the fungal hyphae from the roots of *Orchis incarnata* were dissected by means of a micro-manipulator and transferred to agar or plasmolysed, it was concluded that during the early stages of infection the hyphae are capable of further growth, and that as the histological changes become apparent the fungus gradually loses its vitality. The addition of small quantities of extracts from tubers, stems, leaves, and roots of orchids to young cultures of the endophytic fungus resulted in all cases in an inhibition of fungal growth and the complete decomposition of hyphae within three or four days, root extracts being much less toxic than those prepared from tubers or stems. Sap of host cells withdrawn by means of a micro-pipette and added to blocks of agar smear cultures produced visible changes in the hyphae within 24 hours, and at the end of four days some empty hyphae could be seen. Extracts withstood heating for five minutes at 50° C., but were inactivated when heated for a similar period at 60°.

An interesting observation was made by the author on roots of *O. incarnata* exposed to light so that they could develop chlorophyll: the root cells on the upper side were found to possess chloroplasts and showed no trace of infection, while those on the lower side were infected, indicating that the formation of chlorophyll is accompanied by immunity from infection.

Bawden (F. C.) & Pirie (N. W.). **The purification of insect-transmitted plant viruses.**—*Brit. J. exp. Path.*, xx, pp. 322–329, 1939.

Liquid crystalline preparations of nucleoproteins were obtained from White Burley tobacco plants infected with the insect-transmitted potato virus Y [*R.A.M.*, xviii, pp. 60, 472], using the following method. Plants were cut down about a month after infection, minced, the sap expressed and clarified, and then centrifuged repeatedly, ammonium sulphate being added; at one stage the precipitate was dialysed and again centrifuged. The final yield varied between 0·5 and 1·5 mg. per l. of infective sap. In their general physical properties these preparations resembled those of potato virus X [ibid., xix, p. 48], but were more readily denaturated by heat, acid, and ageing. They showed anisotropy of flow, and gave specific precipitates of the flagellar type with antisera when diluted to 1 in 10^6. The purification process seemed to render much of the virus non-infective without destroying its serological activity, but as the virus does not give countable local lesions, accurate quantitative tests of its infectivity could not be made. Purified pre-

parations of the virus were not inactivated by freezing and thawing; they retained their infectivity and their optical properties for some weeks when kept cold, but at room temperatures both were lost in a few days. In crude sap the virus was destroyed at hydrogen-ion concentrations above P_H 5, but in purified preparations these had no effect, whereas after 3 hours at P_H 9·2 the virus was non-infective but still retained one-half of its serological activity, which was quite lost after the same time at P_H 10·3. The purified preparations contained 14 to 16 per cent. of nitrogen and from 0·3 to 0·5 per cent. phosphorus. The most usual impurity was a complex, containing both lipoid and carbohydrate [the chief properties of which are described].

Similar methods of purification were used with the *Hyoscyamus* virus 3, also insect-transmitted [ibid., xviii, p. 202], and the material obtained (about 1 to 3 mg. per l. of sap) showed anisotropy of flow and general properties essentially similar to those of virus Y. The two viruses are, however, not related, for antisera prepared against one did not react with the other.

SALAMAN (R. N.) & WORTLEY (W. R. S.). **Potential hosts of Potato viruses in garden and field.**—*Nature, Lond.*, cxliv, 3660, pp. 1049–1050, 1939.

In 1938 potato leaf roll was successfully transmitted by means of grafts at the Potato Virus Research Station, Cambridge, to *Matthiola* and *Campanula*, both of which acted as carriers. In the following year the same disease was conveyed by grafting from potato to turnip and back to a President potato, and by *Myzus persicae* [cf. next abstracts] from potato to Brussels sprouts and back to potato. Neither crucifer showed any symptoms, but the virus recovered in the Presidents caused a typical leaf roll in the former case and an ill-developed and ambiguous syndrome in the latter. An unexpected complication, however, arose through the fact that in a number of instances the virus carried over to the potato and thence to tobacco or *S*[*olanum*] *glutinosum* from infected *Brassica* spp. or other extraneous hosts was not leaf roll but Y. On close examination this virus was found to be harboured by the experimental potatoes, which had exhibited acute leaf roll for nearly 20 years without a trace of the typical Y symptoms. It was ascertained that the Y virus can be carried in a masked form by turnips, cabbage, kale, Brussels sprouts, red clover [*Trifolium pratense*], garden peas, and bindweed [*Convolvulus avensis*], and conveyed from crucifers to potatoes by grafting or with the aid of *M. persicae*, and thence to tobacco and *S. glutinosum*. *B.* spp. frequently serve as overwintering hosts for *M. persicae* [*R.A.M.*, xvi, p. 551 *et passim*], and it is suggested that they and the almost ineradicable bindweed may also act as reservoirs during the cold season for the destructive potato viruses under discussion.

QUANJER (H. M.). **De Perzikbladluis, een gevaar voor de cultur van Aardappelen en andere gewassen.** [The Peach aphid, a threat to the cultivation of Potatoes and other crops.]—*Tijdschr. PlZiekt.*, xlv, 5, pp. 224–232, 1939.

In connexion with a recent study by H. R. Lambers (*Landbouwk.*

Tijdschr., Wageningen, 1, 619, 1938) on the life-history of the peach aphid (*Myzus persicae*), the writer summarizes other outstanding contributions to the knowledge of the biology of the insect, with special reference to its activities as a vector of virus diseases of potatoes [*R.A.M.*, xviii, pp. 131, 133, 578, *et passim*] and other crops. The virtual absence of serious virus diseases from Estonia, according to a recent report by W. Roots to the Dresden Agricultural Congress, 1939, places the potato trade of that country in a very favourable position; among the factors contributing to the healthy condition of the crops are the low mean annual temperature (4·9° C. as compared with 9° in Holland), the intensive breeding and selection work in progress at Jögeva, and the stringent enforcement of quarantine regulations for imports. The possibility of reducing aphid infestation in Holland by the official restriction of peach- and apricot-growing is briefly considered.

KRAMER (M.). **A degenerescência e a defesa da cultura da Batatinha.** [Degeneration and the defence of Potato cultivation.]—*Biologico*, v, 12, pp. 265–272, 1939.

Following a brief survey of the various theories advanced in explanation of the problem of potato degeneration, the author discusses the possibilities of combating the trouble in the Argentine and suggests four general measures of control, viz., (1) the stimulation of vigorous growth by spraying against insects and fungi; (2) the procurement of seed from mountainous regions where humid conditions and strong winds prevail during the growing period [cf. preceding and next abstracts]; (3) the extirpation of foci of infection by clean cultivation, crop rotation, elimination of susceptible wild Solanaceae, and prompt roguing of suspected individuals in stands destined for seed; and (4) the use of certified seed from an approved source [see next abstract].

SILBERSCHMIDT (K.). **A pratica da produção de tuberculos-sementes de Batatinhas do país.** [The practice of the production of seed tubers of home-grown Potatoes.]—*Biologico*, v, 12, pp. 279–284, 1 fig., 1939.

A co-operative society having been founded in the Argentine for the production of home-grown seed potatoes, the writer discusses the practical measures to be taken to secure the success of the project. Seed should be procured from a reliable source, either from a healthy zone such as Cotia, or from Holland or Germany, and planted out in a suitable locality, for instance, the mountainous region of Cascata, where the humid climate is particularly favourable for this purpose [see preceding abstract].

In addition to the three European varieties commonly cultivated in the Argentine, viz., Eigenheimer, Bintje, and Konsuragis, a considerable trade is carried on with indigenous stocks. The Argentine potatoes suffer severely from degeneration, the incidence of which may amount to over 50 per cent. [*R.A.M.*, xvii, p. 266], but they possess valuable commercial qualities and fetch high prices on the Rio de Janeiro market. In their cultivation it is absolutely necessary to practise rigorous roguing. Directions for the control of virus diseases include the eradication from the vicinity of the breeding plots of all other Solanaceae and

the restriction of cultivation of peaches and other crops (e.g., crucifers, curcurbits, and beans [*Phaseolus vulgaris*]) liable to harbour aphids. In order to prevent the transmission of infection by aphids from diseased to healthy tubers in storage, the rooms should be fumigated, while the potatoes are still in the dormant state, with 98 per cent. nicotine, using a minimum quantity of 2·5 c.c. per 10 cu.m.

BOYD (O. C.). **Two diseases of Potato newly reported from Massachusetts.**—*Plant. Dis. Reptr*, xxiii, 19, p. 322, 1939. [Mimeographed.]

During the autumn of 1939, potatoes in Massachusetts were affected by bacterial wilt and soft rot, presumably due to *Bacterium sepedonicum* [*R.A.M.*, xix, p. 114], a severe case of pink rot (*Phytophthora erythroseptica*) [ibid., xix, p. 40] occurring elsewhere in the same State. This is stated to be the second report of potato pink rot in the United States.

EDDINS (A. H.). **Some characteristics of bacterial ring rot of Potatoes.**—*Amer. Potato J.*, xvi, 12, pp. 309–322, 5 figs., 2 diags., 1939.

This is a discussion of the similarities and differences between bacterial ring rot (*Phytomonas sepedonica*) [*Bacterium sepedonicum*: see preceding abstract] and brown rot (*P. solanaceara*) [*Bact. solanacearum*] of potatoes [*R.A.M.*, xviii, p. 473], supplemented by recent information on seed and soil transmission and the influence of environmental factors in connexion with the former disease in Florida.

Climatic conditions limit the occurrence of brown rot in the United States to areas situated in the south Atlantic and Gulf Coast States from Maryland to Texas, and in Pennsylvania, Ohio, Illinois, West Virginia, and Kentucky, whereas bacterial ring rot appears to develop without restriction in any part of the country as well as in Canada. Both diseases are seed-borne, but brown rot is not usually transmitted in this way, since the seed used in most sections of the States is produced in localities from which *Bact. solanacearum* is absent. Both pathogens generally cause partial or complete wilting, but in the case of ring rot the mottled leaves roll upwards before wilting and dying, whereas in that of brown rot the faded foliage collapses and turns brown without mottling or rolling. There are no stem symptoms of ring rot comparable with the brown vascular discoloration typical of brown rot. Tuber ring rot is induced by both organisms, accompanied in the case of *Bact. sepedonicum* by a reddish-brown discoloration of the skin and sometimes by cracking, which may extend to the cortex and outer storage parenchyma; *Bact. solanacearum* causes a brown to black discoloration of the tissues without cracking. The brown rot bacteria are viscous and are exuded from the stolon end and eyes, where they may mingle with dirt and dry on to the tuber surface; those of *Bact. sepedonicum* are not sticky and do not ooze from the tuber. The marked, ring-like appearance of the brown rot symptoms, which tend to be confined to the vascular area and immediately adjacent tissues, is less striking in ring rot, the areas affected by which are soft, pliable, grey, cream, yellow, or reddish-brown in contrast to the shiny consistency and brown to black tinge of brown rot decay.

When tubers affected by ring rot were held for five months at

different temperatures, infection developed rapidly at 70° to 75° F. (50·6 per cent.), less rapidly at 60° to 65° (41·3), and slowly at 37° (11·5).

Most of the potato samples from infected seed stocks obtained from Maine and grown at Hastings, Florida, showed an increase in the percentage of bacterial ring rot compared with that reported for the same stocks in their place of origin. Infection was found to be spread by means of the workers' hands and cutting knives, but not through the soil. Losses from the disease at Hastings in the Spaulding Rose and Katahdin varieties decreased from 5 per cent. in 1937 to 0·5 per cent. in 1939 as a result of the use of certified seed.

BELL (A. F.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd, 1938–39*, pp. 45–59, 1939.

In this report [cf. *R.A.M.*, xviii, p. 274] it is stated that under the provisions of the Queensland Amended Sugar Experiment Stations Act, which received assent on 27th October, 1938, sugar-cane is excluded from the scope of the Diseases in Plants Act [ibid., ix, p. 607]. All powers for disease control in respect of sugar-cane are vested in the Director of Sugar Experiment Stations, who must issue annually a list of sugar-cane varieties approved for planting in each mill area, such approval remaining valid for three years after the year of planting. The cultivation or possession of any variety not approved may involve a substantial penalty. Provision is made for the production, introduction, and cultivation of experimental varieties under the authority of the Director. Queensland is divided into ten quarantine districts, and the removal of sugar-cane from any one such district to another without special permission is forbidden. Full provision is made for the inspection of fields and properties and for the treatment or destruction of diseased cane. Any area may be declared diseased, and control Boards, financed by compulsory levy and responsible for implementing control measures, constituted therein. [In *Qd agric. J.*, lii, 3, p. 350, a list is given of six districts in Queensland which have been declared infested areas, and in which disease control Boards are to be set up. The diseases concerned are downy mildew (*Sclerospora sacchari*), Fiji disease, and gumming (*B[acterium] vasculorum*)].

With the increased use of resistant varieties, gumming disease [*R.A.M.*, xix, p. 116] is now negligible in Southern Queensland, while with the elimination of S.J. 4 and H.Q. 426, as well as some nondescript, highly susceptible varieties, it has also decreased in the Mulgrave area. In a trial in the last-named district, S.J. 4, H.Q. 426, Q. 19, and Q. 26 were inferior, Q. 22, Q. 10, Q. 16, and Q. 27 equal or slightly superior to, and Q. 13 and Q. 29 markedly superior to, D. 1135 in resistance, this cane being accepted locally as the standard of minimum resistance. In a trial progressing in Brisbane, S.J. 4, Q. 19, and H.Q. 426 are less resistant than D. 1135 and 1900 seedlings, while Q. 10, Q. 13, Q. 20, Q. 21, and 31–1389 show a higher resistance that approximates to that of Q. 813.

As a result of eradication, inspection, and roguing work the Fiji disease situation in the Bundaberg area [loc. cit.] has improved. Progress inspections failed to reveal infection in Jason, Co. 290, C.P. 29/116, P.O.J. 213, Q. 813, and *Erianthus*; Q. 23 showed resistance, and Q. 25

fell into the same class as D. 1135, Comus, and P.O.J. 2878. Co. 419, a cross between P.O.J. 2878 and Co. 290, showed high susceptibility.

When water at 52° C. was passed continuously for 20 minutes over single buds, alternate buds being left untreated as controls, and all being then planted, a total of 18 control buds gave nine stools definitely affected with chlorotic streak [ibid., xviii, p. 274], as against only three for the same number of treated buds. In a chlorotic streak varietal resistance trial the percentage ratios of diseased to healthy stools for the varieties 'X' 1, 'X' 14 (both Black Cheribon × *S[accharum] robustum*), P.O.J. 213, Co. 290, Vulcan, Uba, P.O.J. 234, and Q. 4 were, respectively, 4, 3, 3, 3, 1, 0, 0, and 0 per cent. compared with 97 per cent. for S.J. 4; in a second trial on another farm the corresponding figures for 'X' 1, 'X' 14, P.O.J. 213, Co. 290, Uba, P.O.J. 234, and S.J. 4 were 4, 1, 2, 1, 4, 3, and 68 per cent., the figures for Co. 290 and P.O.J. 234 each including a doubtful case.

In a varietal resistance trial against leaf scald (*Bact. albilineans*) [loc. cit.] the varieties Co. 270, Co. 421, 24 R 1057, 25 R 96, 25 R 408, 25 R 491, 30 MQ 2124, Vulcan, Q. 2, Q. 10, Q. 1098, and P.O.J. 2878 gave no diseased stool from any inoculated sett compared with more than 75 per cent. diseased stools for 30 R 61.

The chief sugar-cane problem in Queensland is downy mildew (*Sclerospora sacchari*) [ibid., xviii, p. 549]. As the disease has been present for many years in nearly every cane-growing area, and the Kassoer and Chunnee breeding lines are highly susceptible to it, it is also a limiting factor in the control of other diseases. In resistance trials at Bundaberg and Mackay no infection was shown by Q. 25, C.P. 29/116 (E. 12), and Comus (F. 40) and over 75 per cent. infection by P.O.J. 213, 2940, and 2878, Q. 24, and Co. 419. In an alternate host trial the maize varieties, Imperial Yellow Dent, Funk's 90-Day, and Reid's Yellow Dent planted among diseased P.O.J. 2878 and 213 canes rapidly became heavily infected, producing abundant spores from both leaf surfaces. Sugar-cane was then reinfected by placing freshly cut setts of P.O.J. 213 under the leaves of the diseased maize. It is evident that in the presence of downy mildew the planting of maize near sugar-cane should cease. The maximum and minimum temperatures for the sporulation of *S. sacchari* were, respectively, about 31° and 16°; abundant sporulation, with no defined optimum, occurred between 21° and 28·5°. Spore production occurred in darkness, but appeared to require some exposure to sunlight each day.

MUNDKUR (B.B.). **Taxonomy of the Sugar-Cane smuts.**—*Kew Bull., 1939*, 10, pp. 525–533, [issued 1940].

After briefly discussing the confusion existing in the nomenclature of the smuts attacking species of *Saccharum* and *Erianthus*, the author states that in view of the opinion expressed by Sydow [*R.A.M.*, iv, p. 127] that there may be, in addition to *Ustilago scitaminea* and *U. consimilis*, a third culmicolous smut attacking *Saccharum*, distinguishable by spore size, he made a critical examination of available collections of sugar-cane smuts. These included collections from India (52), the Philippines (11), China (3), Java (3), Natal (2), Burma (1), and Mauritius (1). As a result, it was ascertained that the smuts were

divisible into two species and two varieties, of which the latter are regarded as new. The first of these new varieties, *U. scitaminea* var. *sacchari-barberi* n. var., was mentioned (but not described) by Sydow in 1924 as intermediate between *U. consimilis* and *U. scitaminea* [loc. cit.]; it attacks *S. spontaneum*, *S. barberi* (the type host), and *S. officinarum*, and appears to be moderately common in northern and eastern India and was also found in material from Mauritius. It is described as differing from the type species in its 'mummy-brown' spores, which measure 5·1 to 8·6 (average, 6·7) μ in diameter, and have a thick, very minutely verrucose epispore with a rough margin. The second new variety, *U. scitaminea* Syd. var. *sacchari-officinarum* n. var., occurs on *S. officinarum* and *S. spontaneum* and differs from the type species in its 'Vandyke brown' spores, which measure 6·5 to 11·3 (average 8·4) μ in diameter, and have a moderately thick, coarsely echinulate epispore. The type is U.S.D.A. Mycological and Pathological Collections, No. 60442, collected by Reinking in 1917 at Los Baños and issued as *U. sacchari* Rabenh. Emended descriptions of *U. consimilis* and *U. scitaminea* are given, together with a key to the species and varieties.

IMAZEKI (R.). **Observations on Japanese fungi (III). Some hard and perennial Stereums in Japan.**—*J. Jap. Bot.*, xv, 9, pp. 578–588, 20 figs., 1939. [Japanese, with English summary.]

A key is provided to the nine species of *Stereum* of the coriaceous-woody type (including a new one, *S. hiugense* [with a Latin diagnosis], the cause of a white rot of oak), investigated by the author on hardwoods and conifers in Japan and described in the present paper.

Mycological Society of America. Fungi collected at the foray, August 1938.—*Mycologia*, xxxi, 6, pp. 728–736, 1939.

A list is given of 836 species and varieties of fungi collected by members of the Mycological Society of America during the foray held at Duchesnay, Quebec, 23rd to 27th August, 1938.

TEHON (L. R.). **New species and taxonomic changes in the Hypodermataceae.**—*Mycologia*, xxxi, 6, pp. 674–692, 6 figs., 1939.

Descriptive notes [with Latin diagnoses] are given on nine new species belonging to the Hypodermataceae, as well as on seven established species, two of which are transferred from *Lophodermium* to *Clithris*. *Lophodermina rhododendri* having been found in 1931 on the stems of *Rhododendron californicum*, its habitat is extended to include attack on stems. The fungus appears to cause a die-back of infected twigs. In the material from the stems of *R. californicum* the ascospores differ from those hitherto found on leaves in that they taper basally to needle-like points, in this respect resembling very long-spored species of *Hypodermella*.

OVERHOLTS (L. O.). **Geographical distribution of some American Polyporaceae.**—*Mycologia*, xxxi, 6, pp. 629–652, 30 maps, 1939.

In this Presidential address to the Mycological Society of America the author discusses the geographical distribution of the Polyporaceae

of the United States and Canada and the factors determining this distribution. By comparing maps showing the known occurrence of various pileate species with others illustrating the range of the principal hosts he attempts to fill in the gaps in present-day knowledge of the distribution of these fungi and to suggest likely extensions in geographical range.

Overholts (L. O.). **The genus Stereum in Pennsylvania.**—*Bull. Torrey bot. Cl.*, lxvi, 8, pp. 515–537, 5 pl., 1939.

In this monograph 27 species of *Stereum* [cf. preceding page] are described and a key is given to facilitate identification. *S. purpureum* [*R.A.M.*, xv, p. 103] is found on the dead wood of various deciduous trees and perhaps occasionally on conifers. It is fairly widespread in Pennsylvania and specimens have also been received from ten other States of the Union, as well as from Canada (Ontario). *S. rugosiusculum*, on the same hosts as the foregoing, is maintained as a distinct species, differing chiefly from *S. purpureum* in the presence of cylindrical, hyaline cystidia, 4 to 6 μ in diameter [ibid., iii, p. 343]. This species is widely distributed in the United States and has also been reported from British Columbia.

Guyot (A. L.). **Les Urédinées (ou rouilles des végétaux). I. Uromyces. [The Uredineae (or plant rusts). I. Uromyces.]**—(*Encycl. mycol.*, Vol. VIII), 439 pp., 62 figs., 26 maps, Paris, Paul Lechevalier, 1938. [Received January, 1940.]

This first part of this valuable monograph deals with species of *Uromyces* found on Gramineae, Cyperaceae, Juncaceae, Ranunculaceae, Polygonaceae, Umbelliferae, and Campanulaceae in Europe, Western Asia, and North Africa, and notes are also appended on records from other localities. Following a general discussion of the genus the author divides it into the following morphologic types based on teleutospore characters, viz., *papillati*, *coronati*, *crassi*, *tenues*, *angulati*, and *verrucosi*. Each species is described with its synonymy, exsiccata from the area covered, figures, hosts, geographical distribution, and notes on biology. The bibliography comprises 752 titles.

[Corrections and additions to this work appear in *Uredineana*, i, pp. 161–177, Paris, Paul Lechevalier, 1939, the two volumes being sold together, price 300 Fr.]

Long (W. H.) & Goodding (L. N.). **Two new species of rust.**—*Mycologia*, xxxi, 6, pp. 670–673, 1 fig., 1939.

Of the new rusts from Arizona described in this paper, *Gymnosporangium vauqueliniae* n. sp. was found on Rosaceae, the pycnidia and aecidia being typically present on *Vauquelinia californica* and the teleutospores on *Juniperus monosperma*.

Mains (E. B.). **New and unusual species of Uredinales.**—*Bull. Torrey bot. Cl.*, lxvi, 9, pp. 617–621, 1939.

Among the new or otherwise interesting rusts (ten in all) described with critical annotations in this paper may be mentioned *Frommea mexicana* n. sp. [with a Latin diagnosis] on *Fragaria mexicana* in

Mexico, characterized by sparse, pulverulent, pale yellow uredosori, ellipsoid or obovoid, hyaline, echinulate uredospores, 16 to 20 by 13 to 16 μ, sparse, cinnamon-brown teleutosori, and cylindrical to clavate, bi- or triseptate teleutospores, 38 to 60 by 23 to 32 μ, with hyaline pedicels up to 50 μ in length. With the doubtful exception of *Phragmidium fragariastri*, this appears to be the first record of a rust on a strawberry.

HIRATSUKA (N.). **Miscellaneous notes on the East Asiatic Uredinales with special reference to the Japanese species (VI).**—*J. Jap. Bot.*, xv, 10, pp. 621–627, 2 figs., 1939.

This further instalment of the author's critically annotated list of eastern Asiatic (chiefly Japanese) Uredinales [*R.A.M.*, xix, p. 45] comprises 21 species, including *Melampsora larici-epitea* on willow (*Salix viminalis*) [ibid., xv, p. 175], *M. larici-populina* on poplar (*Populus nigra* var. *italica*), both new to Korea, *Puccinia fagopyri* on buckwheat [ibid., xii, p. 248], and *M. medusae* [ibid., vii, p. 61] on *Populus maximowiczii*, both recorded for the first time in Japan; the last-named differs from *M. larici-populina* in its smaller uredo- and shorter teleutospores.

HIRSCHHORN (ELISA). **Las especies de 'Cintractia' de la flora Argentina.** [The species of *Cintractia* of the Argentine flora.]—*Rev. argent. Agron.*, vi, 3, pp. 179–202, 4 pl., 2 figs., 1939.

On the basis of an examination of specimens in the Spegazzini herbarium and other material the author describes ten species and varieties of *Cintractia* for the Argentine. The list includes one new variety and two new combinations, the kernel smut of sorghum, *Sphacelotheca sorghi*, being transferred to *Cintractia*.

DRECHSLER (C.). **Three species of Pythium with large oogonial protuberances.**—*Phytopathology*, xxix, 12, pp. 1005–1031, 10 figs., 1939.

Amplified diagnoses are given of *Pythium mastophorum* and *P. polymastum*, originally isolated from *Bellis perennis* and lettuce, respectively, in the United States [*R.A.M.*, x, p. 211]. The two species are considered to be closely related, the oogonial and oospore diameters on maize meal cultures of the former ranging from 25 to 41 and 21 to 35 μ, respectively, and those of the latter from 26 to 59 and 21 to 46 μ, respectively. Another species apparently falling into the same group is *P. megalacanthum*, associated with flax scorch and the decay of various ornamentals in Holland [ibid., xviii, pp. 154, 268], though the affinities of this organism are considered to present a very complex problem, the final solution of which may involve its transference to the section of the genus comprising such spiny, proliferous forms as *P. anandrum* [ibid., xviii, p. 651], while a relationship with *Phytophthora stellata*, described by L. Shanor [as occurring on Rhododendron petals in cold spring water in North Carolina] (*J. Elisha Mitchell sci. Soc.*, liv, pp. 154–162, 1938), is also indicated. The oogonial and oospore diameters of a Baarn culture of *Pythium megalacanthum* ranged from 25 to 82 μ and 20 to 66 μ, respectively, values which conflict materially with those furnished by de Bary, viz., 36 to 45 and 27 μ, respectively

(*Bot. Ztg*, xxxix, 1881). From these and other discrepancies the author concludes that there is not sufficient evidence to identify the fungus described as *P. megalacanthum* in recent reports with that originally isolated by de Bary.

NEILL (J. C.). **The mould fungi of New Zealand. II. The genus Aspergillus.**—*Trans. roy. Soc. N.Z.*, lxix, 2, pp. 237–264, 1939.

Continuing his studies on New Zealand moulds [cf. *R.A.M.*, xvi, p. 775], the author describes 18 species of *Aspergillus* encountered during the past four years in the course of industrial and soil-mycological investigations. Particulars are also given of a further 17 species of dubious authenticity, not yet recorded in New Zealand, together with lists of rejected species. He relegates to synonymy all of the other 66 specific names accepted by Thom and Church.

KASSANIS (B.). **Intranuclear inclusions in virus infected plants.**—*Ann. appl. Biol.*, xxvi, 4, pp. 705–709, 1 pl., 1939.

Crystalline plate-like inclusions were found to occur in the nuclei of Solanaceous plants infected with the severe etch virus of tobacco [*R.A.M.*, xvii, p. 352]. These inclusions were invariably found in both young and old plants of all susceptible species and in every tissue of the infected plant except at the growing points of the roots and stems. They were much more common than the amorphous cytoplasmic inclusions, similar to X-bodies, which were also present. Most nuclei contained more than one and up to 15 crystalline inclusions. These are thin, rectangular plates of variable size, the lengths of their sides measuring from 3 to 10 μ. Between crossed Nicol prisms they show no extinctions either because they are optically isotropic or too small to give a visible effect. They usually appear from 12 to 16 days after infection or a week after external symptoms become manifest, and persist for several months. They are more stable than either the cytoplasmic inclusions or the crystalline inclusions of tobacco mosaic virus, respond readily to acid dyes but not to Feulgen's reagent, stain brown with osmic acid, and yellowish-brown with iodine, and are unaffected by the usual methods of decalcification of fixed tissues. They are stated to resemble in many ways the intranuclear inclusions described in the polyhedral disease of silkworms.

THUNG (T. H.). **Smetstof en plantencel bij enkele virusziekten van de Tabaksplant V.** [Infective principle and plant cell in some virus diseases of the Tobacco plant V.]—*Tijdschr. PlZiekt.*, xlv, 6, pp. 247–259, 1939. [English summary.]

Continuing his studies at the Vorstenland Experiment Station, Java, on the protective action of certain tobacco viruses against others [*R.A.M.*, xviii, p. 207], the writer found that the simultaneous inoculation of Kanari-Vorstenland tobacco plants with the Rotterdam B virus and, on the same or different leaves, that of one of the other sap-inoculable diseases, viz., ordinary, severe, white, mild, or Holmes's distorting mosaic, causes a retardation in the development of Rotterdam B symptoms but not of those of the other disorders. The delay was longest in the case of white mosaic and shortest in that of distorting.

No retardation in the development of white mosaic symptoms occurred as a result of inoculation with Rotterdam B virus and subsequently (within six days) with white mosaic; after longer intervals, however, delay does take place, its length being proportionate to the period elapsing between the inoculations.

The premature flowering of tobacco plants mildly infected by Rotterdam B disease, and showing a slight excess of starch in the foliage, is tentatively attributed to the destruction by the virus of the transport channels for carbohydrates as well as for the various mosaic viruses. However, if one or other of the latter has first invaded these channels, the access of the Rotterdam B virus to the growing points of the plants is prevented or retarded. This theory involves the assumption, also accepted by C. W. Bennett in the case of beet curly top [ibid., xvi, p. 650], that the same transport channels serve both for viruses and assimilation products. The virus particles are reproduced within the cells constituting the transport channels.

The mutually antagonistic effects of the viruses under discussion are presented in tabular form, showing at a glance which particular virus can immunize a tobacco plant against infection by others of the same group. The dominating influence of white, distorting, mild, and ordinary mosaic over other diseases varies but slightly: white mosaic is less powerful when inoculated simultaneously with the ordinary mosaic virus, but if inoculated first is capable of immunizing its host against the last-named. The symptoms of the viruses transmissible by *Myzus persicae* (speckled mosaic and streak) are not in reality suppressed by the others, although they may be masked; they are capable of reproducing themselves in plants affected by the sap-inoculable diseases. The immunization of tobacco plants against insect-transmissible viruses by inoculation with those of the sap-inoculable group is therefore impracticable.

Boyd (C. C.). **Downy mildew injury of Tobacco in the field and after harvest in Massachusetts.**—*Plant Dis. Reptr*, xxiii, 23, pp. 381–382, 1939. [Mimeographed.]

Observations on the course of downy mildew (*Peronospora tabacina*) on shade tobacco [*R.A.M.*, xviii, p. 482] in Massachusetts in 1937 led to the following recommendations for the exclusion of the disease from the field: continuation of the seed-bed treatments throughout the re-stocking season and prompt destruction of the beds on the completion of re-stocking. The same precautions should be adopted by owners of Havana seed-beds, which may otherwise contract the disease during or after re-stocking and thus serve as a dangerous source of infection for neighbouring or even more distant shaded fields.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 12, pp. 667–669, 3 figs., 1939.

The methods recommended for the control of tomato leaf spot (*Septoria lycopersici*) [*R.A.M.*, xviii, pp. 353, 421] in New South Wales consist of the use of clean seed-boxes and soil for the growth of seedlings, crop rotation, spraying the seed-beds with Bordeaux mixture (1–1–20), and plants well established in the field with the same at 1–1–10, in both cases at fortnightly intervals, and the removal and destruction of

crop debris. Old seed-boxes may be cleaned with formalin solution (1 in 50), and the soil can be sterilized by drenching with formalin.

Celery black heart [ibid., xvii, p. 647] has been observed in several places in New South Wales. In the Windsor area it has caused very serious losses in irrigated crops.

CURTIS (K[ATHLEEN] M.). **Control of Tomato leaf-mould : the value of different sprays.**—*N.Z.J. Sci. Tech.*, xxi, A, 3, pp. 187–192, 3 figs., 1939.

In spraying experiments in 1938–9 at the Cawthron Institute, Nelson, New Zealand, in the control of leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xvii, p. 79], the best results as regards elimination of the fungus were secured by weekly applications (starting one week after planting out) of copper emulsion (4 lb. copper sulphate and 20 lb. potash soft soap per 100 gals.) and red copper oxide (1 lb. plus 1 gal. cottonseed oil and 2 lb. lethalate [ibid., xvii, p. 685]), followed by shirlan WS [ibid., xviii, p. 461] (3lb. on 3rd, 10th, and 17th October, 1½lb. thereafter), shirlan AG (3 lb.), and bouisol (2 lb. plus 5 lb. potash soft soap). The following yields per plant were obtained: untreated 6·3 lb., shirlan WS 9, shirlan AG 8·8, copper emulsion 7·1, red copper oxide 8·2, and bouisol 7·1. From the commercial standpoint the two shirlans proved the most satisfactory of the fungicides tested, though a tendency on the part of WS to cause leaf scorch when applied under power precludes its recommendation for this purpose at present.

WOLF (F. A.). **Fungi of the Duke Forest and their relation to forest pathology.**—*Bull. Sch. For. Duke Univ.* 2, 122 pp., 53 figs., 1938. $1.00. [Received February, 1940.]

This bulletin, in the compilation of which the author was assisted by K. H. Garren and J. K. Miller, records the fungi collected over a period of six years in the Duke Forest, North Carolina, with the object of providing a basis for future research in forest pathology. A general outline and discussion of the larger fungus groups encountered in the area under observation is followed by a more detailed consideration of the principal agents of tree diseases and decays in the forest, arranged topically under the affected hosts. Fungus and host indexes are appended.

LORENZ (R. C.) & DAVIDSON (R. W.). **Observations on several diseases of hardwoods in the Lake States.**—*Plant Dis. Reptr*, xxiii, 23, pp. 384–385, 1939. [Mimeographed.]

In March, 1939, a box elder (*Acer negundo*) of intermediate crown classification on the Little Fork River east of Grand Falls, Minnesota, was observed to bear a canker similar to that prevalent on maples (*A.* spp.). The heavy, buff-coloured mycelial fans typical of *Eutypella parasitica* [*R.A.M.*, xviii, p. 147] were found under the bark, in the central area of which abundant perithecia were also present. An American elm (*Ulmus americana*) in the same locality and another in northern Minnesota (both suppressed) were attacked by *Schizoxylon microsporum* [loc. cit.], the apothecial and pycnidial stages both fruiting on the marginal area of the canker on the first-named tree. In

1936 butt and trunk rot of living black ash (*Fraxinus nigra*) caused by *Fomes conchatus* [ibid., xiv, p. 193] was observed in northern Wisconsin and Lower Michigan, and subsequently the fungus has also been collected on the same host in northern Minnesota.

CAMPBELL (W. A.). **Daedalea unicolor decay and associated cankers of Maples and other hardwoods.**—*J. For.*, xxxvii, 12, pp. 974–976, 1 fig., 1939.

In the course of a butt rot study in the Green Mountain National Forest, Vermont, *Daedalea unicolor* [*R.A.M.*, xviii, p. 335] was found producing extensive yellow, later dull white cankers, sometimes girdling the trunk, on living sugar and red maples (*Acer saccharum* and *A. rubrum*), paper and yellow birch (*Betula papyrifera* and *B. lutea*), and once on elm (*Ulmus americana*). On one area about 13 per cent. of the dissected sugar maple sprouts were rotted by *D. unicolor*, which is very destructive, trees with five- to seven-year-old infections being sufficiently weakened to be thrown by wind. Entry is commonly effected through dead or cut companion sprouts. The fungus is able to attack the heartwood, and in this respect appears to act as a parasite.

LONG (W. H.). **Two pocket rots of hardwood trees.**—*Bull. Torrey bot. Cl.*, lxvi, 9, pp. 625–627, 4 figs., 1939.

In the course of field investigations in Florida from 1913 to 1918, the writer detected the hymenophores of *Fomes extensus* in association with a basal white pocket heart rot of living *Exothea paniculata*, *Lysiloma bahamensis*, and *Taxodium distichum*, the decayed area uniformly extending downwards into the roots and upwards into the butts for a distance of 2 to 3 ft. In *E. paniculata* the white, lens-shaped pockets, 5 to 20 by 2 to 10 mm. long in radial section, are filled with cellulose, which is slowly absorbed by the fungus, leaving small cavities lined with fibre remnants. The pockets expand faster longitudinally than radially, with the result that the cross walls are gradually destroyed and the rotting wood separates into thin, longitudinal, irregular sheets with a central layer of dark brown, semi-decayed wood. In the final stages of the rot, much of the invaded heartwood is disorganized, leaving large, partially empty pockets lined with fibres and sometimes occupied by a central mass of light, flocculent mycelium. In *L. bahamensis* the rot caused by *F. extensus* is similar to the foregoing, but in *T. distichum* the pockets are much larger (4 to 8 by 1 to 2 cm.) and empty except for a thin, whitish, arachnoid mycelial membrane on the walls.

During the same period investigations in the Mississippi River Valley disclosed the hymenophores of *Polyporus rigidus* on logs and stumps of *Liquidambar styraciflua* showing a characteristic honeycomb rot. Dead, fallen trees of *Nyssa sylvatica*, plane (*Platanus occidentalis*), and oak (*Quercus alba*) were similarly but less conspicuously attacked. The rot pockets in *L. styraciflua* are lenticular, 1 to 2 by 0·5 to 1 cm. in radial-longitudinal section, and filled with a white, arachnoid mycelium in the final stages, when the infected wood is very light. The same fungus was collected in Arkansas, Mississippi, Tennessee, Texas, and Virginia. According to L. O. Overholts, *Polyporus rigidus* is responsible for a well-marked pocket rot in the south very like that caused by *P.*

zonalis [*R.A.M.*, xvii, p. 88], the two species being closely related, with the same minute, thick-walled tubes, and similar spores, hyphae, and basidia. *P. rigidus* is usually resupinate, in which stage it has been identified by some authorities as *Poria undata*, but occasionally develops a very narrow, reflexed pileus.

HERRICK (J. A.). **A microscopical study of the mycelium of Stereum gausapatum Fries.**—*Trans. Amer. micr. Soc.*, lviii, 4, pp. 377–384, 2 pl., 1939.

A microscopic study was made at the Kent State University, Ohio, of 36 monosporous isolates and 21 others on potato dextrose agar of *Stereum gausapatum*, the agent of heavy damage to North American and European oak forests [*R.A.M.*, xix, p. 125 and next abstract]. The advancing mycelium consists of hyphae 1 to 10 μ in diameter, the larger ones furnished with typically non-septate clamp-connexions, often occurring in whorls, while the 'giants' of maximum dimensions, characteristic of fast growing strains, bear multiple clamps (up to six). The submerged hyphae are more irregular than the aerial and free from conspicuous enlargements. Clamp-connexions are almost entirely absent from the densely tangled mass constituting the superficial cottony mat. All the hyphae are thin-walled and circinate individuals are frequently encountered. Vegetative anastomoses were common in all the cultures under observation, but no spores were detected in any. The yellowish colour proper to many old mycelia was found to be due to an oily pigment. It is tentatively concluded that *S. gausapatum* is homothallic.

ROTH (E. R.) & SLEETH (B.). **Butt rot in unburned sprout Oak stands.**—*Tech. Bull. U.S. Dep. Agric.* 684, 42 pp., 11 pl., 5 graphs, 1 map, 1939.

A study of butt rot in unburned oak stands carried out from 1933 to 1936 in the Alleghany, Appalachian, and central regions of the United States showed that for 45 clear-cut plots the average age per plot ranged from 17 to 84 years, and the number of decay cases from 0 to 64 per cent., the average height of decay being 7 to 74 in. The common source of entrance for decay fungi was the parent stump, through which heart-rot fungi entered in 86 per cent. of the cases. Decay incidence was correlated with diameter of parent stump, sprouts from large stumps being more subject to butt rot than sprouts from small ones. Sprouts arising from beneath the ground had the lowest possibility of becoming infected with heart-rot fungi from the parent stump. The presence of stump wounds was correlated with that of butt rot. The time of heartwood formation and subsequent connexion with the parent stump determined the time of earliest infection from the parent stump.

Chestnut oak (*Quercus montana*), white oak (*Q. alba*), red oak (*Q. borealis* var. *maxima*), scarlet oak (*Q. coccinea*), and black oak (*Q. velutina*) showed, respectively, 11, 19, 22, 28, and 39 per cent. decayed sprouts. In 744 sprouts affected with butt rot the linear extent of evident decay averaged slightly over 3 ft. above the ground. *Stereum gausapatum* [see preceding abstract] was responsible for 62 per cent. of all the cases of butt rot for which decay fungi were determined, and *Fistulina hepatica* [*R.A.M.*, xviii, p. 72] and *Armillaria mellea* [ibid.,

xvii, p. 714] for 10 per cent. each. Sixteen species of fungi accounted for the remaining 18 per cent. of butt rot. The 19 species isolated [which are listed] included ten genera; there were nine species of *Polyporus* (including *P. sulphureus* and *P. zonalis*) [see above, p. 245], two of *Stereum*, one of *Poria* (*P. cocos*) [ibid., xiii, p. 657], and one of each of the remainder. As a rule only one fungus was responsible for the major decay in any individual tree. In only 5 out of 508 cases were two or more species isolated from the same sprout, and no two fungi had entered at the same point. In one 95-year-old white oak sprout *S. frustulosum* [ibid., xviii, p. 361] was isolated at a height of 102 in., *Corticium lividum* [ibid., xvi, p. 505] at 200 in., *Polyporus sulphureus* at 276 in., and *S. gausapatum* at 320 in. In a 52-year-old scarlet oak sprout, *S. gausapatum* extended from ground-level to 132 in., *Hydnum erinaceus* [ibid., xvi, p. 716] was isolated at 168 in., and *C. lividum* was found at 180 in. These observations indicated that as a tree ages the possibility of infection by more than one fungus increases.

No relationship was found between hosts and the fungi causing butt rot. *F. hepatica* was isolated from scarlet oak in 42 cases out of 50 from this host, but this preference may have been due to local conditions rather than specialization. The average rate of decay for *S. gausapatum* in the different oak species ranged from 2 in. (white and chestnut oaks) to 3 in. (red oak) per annum. The maximum rate of spread by this fungus was almost twice as rapid in the black oak as in the white oak group.

The paper concludes with suggestions for keeping decay losses at a minimum in sprout oak stands by means of appropriate cultural treatments applicable to very young stands, established stands not over 20 years old, and stands of any age. In the last-named group the longer the rotation the greater need of keeping decay at a minimum. Trees repeatedly cut over are usually highly defective and should be avoided for long rotations. Butt rot is prevalent on trees badly wounded by fire and precautions against decay in these trees are less likely to succeed than on unscarred trees.

HIRT (R. R.). **The development of blister rust on young planted northern White Pine.**—*J. For.*, xxxvii, 12, pp. 967–969, 1 graph, 1939.

The progress of blister rust (*Cronartium ribicola*) [*R.A.M.*, xix, p. 176] in six plantations or northern white pine (*Pinus strobus*) in the Charles Lathrop Pack Demonstration Forest, Warrensburg, New York, during the first five years after their establishment from 1928 to 1933 is reported [ibid., xvi, p. 7]. A single exposure of the young trees to teleutospore-bearing black currant (*Ribes nigrum*) bushes for 12 to 24 hours under natural meteorological conditions resulted in a maximum of 4 per cent. infection, whereas continuous exposure throughout a summer caused up to 69 per cent. Within five years of infection, about one-third of the diseased trees died, but some persisted for up to 11 years. Eventually a plantation will free itself from blister rust through the death of infected trees if sufficiently well protected from subsequent attacks. Under the experimental conditions about one-third of the infected trees survived, mainly because the diseased branches died before the rust became established in the stems. Aecidiospores were

produced on so few blister rust cankers on the young trees that they did not constitute an important factor in local dissemination. The standard control practice of eradicating the alternate host within 900 ft. of the plantation borders afforded efficient protection, permitting only 0·5 per cent. infection within five-year periods.

HIRT (R. R.). **Canker development by Cronartium ribicola on young Pinus strobus.**—*Phytopathology*, xxix, 12, pp. 1067–1076, 1 fig., 1 graph, 1939.

The author fully describes the results of observations on the development of some 1,000 blister rust (*Cronartium ribicola*) cankers on over 16,000 three- to four-year-old northern white pines (*Pinus strobus*) exposed to natural infection from the teleutospores on neighbouring black currants for periods of 12 to 24 hours in two localities of New York State from 1928 to 1933 and from 1935 to 1936 [see preceding abstract].

The fungus becomes established on white pine through the needles and to some extent the time required for it to appear in the bark seems to depend on the distance of the needle spot (the discoloured spot at the site of entry on a needle) from the cortical tissue. Needle spots as far as 4·5 cm. from the bark can give rise to cankers 0·1 cm. in diameter within 12 to 15 months after initial infection, thus permitting the rust to reach the cortex even in dry seasons when the young trees retain their needles for only two summers. Normally the needles of transplants and young plantation stock are retained for two to three years or more, during which period the fungus is able to reach the bark from spots situated at distances of upwards of 4·5 cm. in both current-season and one-year-old needles. About half of all the cankers formed were perceptible by the autumn of the season following that of inoculation, and 94 per cent. by the succeeding spring. The rate of extension of the rust down the branches towards the stem increased with the age of the cankers during the third year, ranging from 0·7 to 5 cm. On 36 trees the average time taken by branch cankers to reach the stem was three years, after which the pines mostly succumbed within $3\frac{1}{2}$ years, though some cases of survival for $6\frac{1}{2}$ were noticed. Aecidiospores were produced in a few of the branch cankers, but commonly their formation was delayed until the cankers had been established for a year or more in the stems.

McCORMICK (FLORENCE A.). **Phaeocryptopus gäumanni on Douglas Fir in Connecticut.**—*Plant Dis. Reptr*, xxiii, 22, pp. 368–369, 1939. [Mimeographed.]

In January, 1938, Douglas fir [*Pseudotsuga taxifolia*] at East Willington, Connecticut, was found to be infected by *Phaeocryptopus gaeumanni* [*R.A.M.*, xix, p. 177], though later the fungus was accidentally discovered on a collection of Douglas fir needles from Salisbury, Connecticut, labelled 'undetermined' and dated 1929. In November, 1939, the author visited Salisbury, and found that the trees from which the needles had been taken were badly diseased or almost dead. Apparently, the fungus acts very slowly in killing infected trees, but produces a yellowish colour and causes heavy defoliation, the trees lingering on in

this condition for years. The fungus has also been found at Taconic, Lakeville, and Sharon, and would appear to be widespread in the north of Connecticut, though not yet found in the south.

ELLIS (D. E.). **Conifer diseases hitherto unreported from the southwest.**—*Plant Dis. Reptr*, xxiii, 21, p. 341, 1939. [Mimeographed.]

The following conifer diseases are believed to be here reported for the first time from the forests of the south-western States: needle blight of Douglas fir (*Pseudotsuga taxifolia*) in Arizona caused by *Rhabdocline pseudotsugae* [*R.A.M.*, xix, p. 178], associated in the early stages with an imperfect fungus resembling *Rhabdogloeum pseudotsugae*; *Elytroderma deformans* on *Pinus edulis* and *P. ponderosa* [ibid., xii, p. 254], also in Arizona, frequently producing witches' brooms on both hosts; and a canker of *P. ponderosa* very similar to that attributed to *Cenangium piniphilum* [ibid., xv, p. 117], to which the causal agent also appears to be closely related, in Arizona and New Mexico, responsible for widespread malformations involving up to 60 per cent. of the reproduction in localized areas near Ruidoso in the latter State but otherwise of slight importance.

SANDU-VILLE (C.). **Exosporium deflectens Karst. auf Blättern von Juniperus communis L. in Rumänien.** [*Exosporium deflectens* Karst. on leaves of *Juniperus communis* L. in Rumania.]—*Bull. Sect. sci. Acad. roum.*, xxi, 5–6, pp. 113–116, 1939.

The writer collected in 1937 specimens of the fungus described by Georgescu and Badea in *Rev. Pădurilor*, part 3, 1935, as *Cercospora juniperina* (syn. *Camarosporium juniperinum*), the agent of needle fall of juniper (*Juniperus communis*) leaves in the eastern Carpathians, Rumania. A comparative examination of the material led to the conclusion that the fungus is neither a *Camarosporium*, being devoid of true pycnidia, nor a *Cercospora*, in which genus the conidia are produced in groups on each conidiophore and not, as in the present case, singly at the apex. Moreover, the hard, carbonaceous structure embedded in the leaf and protruding on the surface is not a dense network of hyphae, characteristic of *Cercospora*, but a sclerotial nodule or sporodochium invading the parenchyma. The organism is referred to *Exosporium deflectens* Karst., originally observed on the same host in Finland, and is furnished with a revised diagnosis. It is characterized by circular, obovoid or deformed, erumpent, smooth, olivaceous to black sporodochia, 0·2 mm. in diameter; pale yellow, oblong or cylindrical, straight, 1- to 4 (? 7)-septate conidia, 22 to 42 by 5 to 6 μ; and cylindrical, dilute fuliginous basidia, 10 to 15 by 5 to 6 μ.

SIGGERS (P. V.). **Scirrhia acicola (Dearn.) n. comb., the perfect stage of the fungus causing the brown-spot needle blight of Pines.**—*Phytopathology*, xxix, 12, pp. 1076–1077, 1939.

The genetic connexion between the imperfect stage of the pine needle blight fungus, usually referred to *Septoria acicola* [*R.A.M.*, xvi, p. 218] but probably more correctly designated *Lecanosticta acicola* (Thüm.) Syd., and the ascigerous phase *Oligostoma acicola* [ibid., vi, p. 126] was determined by the study for 6 to 14 months of 18 monoascospore cultures from four needle collections from two of the three known hosts,

Pinus palustris, *P. taeda*, and *P. thunbergii* from the southern States. The conidia formed in each ascospore culture were found to resemble in shape, size, and colour those produced in cultures arising from conidia. The physiological reaction of the ascospores to environmental factors affecting germination and initial hyphal growth approximated to that of conidia taken directly from the host. Moreover, ascogenous locules often develop on the margins of old stromata of the conidial stage of the needle blight.

The inclusion of the fungus under discussion in *Oligostroma* Syd. is regarded as untenable by reason of its compact, non-clypeate, erumpent stroma in contrast to the non-erumpent, clypeate ascocarps of *O. proteae*, the type species. The stroma of the perfect stage of the brown spot needle blight organism conforms to the characters of *Scirrhia* Fckl, to which it is accordingly transferred as *S. acicola* (Dearn.) n. comb., with an emended diagnosis. The maximum size of the 1- to 18-loculate, linear stroma, usually seated in the mesophyll, is 2·5 by 0·3 mm., the conical to globose or variable, uni- to triseriate locules measuring 40 to 80 μ in diameter. The aparaphysate asci, tapering apically, measure 30 to 35 by 6 to 9 μ and are occupied by hyaline, oblong to cuneate spores, uniseptate past the centre, usually containing oil globules, 9 to 16 by 3 to 4 μ. The ascospores would appear to be disseminated by wind, and are probably responsible for infection found at appreciable heights from the ground on saplings and older trees, the conidia being adapted for dispersal solely by rain splash. Evidence was also forthcoming that the perfect stage of the fungus develops only on needles that are mostly dead, the ascospores being mainly produced during the winter and spring.

BAECHLER (R. H.). **Experiments on toxicity, leaching, and fire-retarding effectiveness of Wolman salts.**—[*Publ.*] *For. Prod. Lab.*, *For. Serv.*, *U.S. Dep. Agric.*, 10 pp., 1 diag., 3 graphs, 1938. [Mimeographed. Received February, 1940.]

A tabulated account is given of experiments at the Forest Products Laboratory, Madison, Wisconsin, to determine the toxicity of the Wolman salts [*R.A.M.*, xix, p. 180], triolith-U [ibid., xv, p. 186] and t[h]analith-U [ibid., xv, pp. 333, 547], to malt agar cultures of the wood-destroying fungi, *Coniophora cerebella* [*C. puteana*], *Lentinus lepideus*, *Lenzites trabea*, Madison No. 517 [ibid., xvii, p. 5], *Poria incrassata*, and *Polyporus vaporarius* [*Poria vaporaria*], and the resistance of these compounds to lixiviation on small southern yellow pine [? *Pinus ponderosa*] sapwood blocks with a moisture content of 14 to 15 per cent. The killing concentrations, expressed as a percentage of the weight of the medium, of thanalith-U were found to be as follows for the six fungi: *L. trabea* 0·30, No. 517 0·20, *Lentinus lepideus* 0·12, *C. puteana* 0·04, *P. incrassata* 0·015, and *P. vaporaria* 0·01, the corresponding figures for triolith-U being 0·12, 0·16, 0·15, 0·015, 0·05, 0·015, respectively. These values are considered to be fully adequate for preservative purposes.

The chromium salt constituents of the preparations proved highly resistant to the severe leaching tests, the total amount lost in this way during a 53-day period being only about 1 per cent. The quantity of

arsenate leached out was about one-fifth, whereas the loss of sodium fluoride was rapid and substantial, involving 70 to 80 per cent. of the amount originally injected.

When the leached blocks were exposed to attack by the six abovementioned fungi in Kolle flasks for four months, a high degree of resistance was shown, compared with the untreated controls, except to the arsenic-tolerant *Lenzites trabea* [ibid., xvii, p. 4], which attacked the thanalith-treated blocks about as severely as the controls.

Rennerfelt (E.). **Behandling av våt slipmassa med lignasan.** [The treatment of moist groundwood with lignasan.]—*Svensk Pappersmasse-Tidn.*, xvi, 3, pp. 51–52, 1939.

In the winter of 1938 lignasan [*R.A.M.*, xviii, p. 425] at rates of 200 and 500 gm. per ton of 50 per cent. dry pulp gave good control of blueing fungi [? *Phialophora fastigiata* and *Pullularia pullulans*] in Swedish factories [ibid., xviii, p. 774], the stock being protected over a period of eight months, during which the untreated check material sustained heavy damage. Experiments on a larger scale later in the same year gave promising results with smaller quantities (125 to 150 gm.) of the fungicide, which should be added to the riding roll of the wet machine rather than on the wire or at the first press. [An English abstract of this paper is published in *Paper Ind.*, xxi, 9, p. 1020, 1939.]

Cunningham (H. S.). **Vegetable seed treatment tests in New York.**—*Plant Dis. Reptr*, xxiii, 23, pp. 380–381, 1939. [Mimeographed.]

In order to test the value of the hot water seed treatment for the control of black rot (*Bacterium campestre*) [*Pseudomonas campestris*] on cauliflower [*R.A.M.*, xiii, p. 610 *et passim*] and other cultivated species of *Brassica*, the New York Farm Bureau in 1939 compared the development on agar plates of treated and untreated samples. Of 11 lots of untreated cauliflower seed, 5 were diseased, the corresponding figures for 23 of cabbage and 46 of Brussels sprouts being 11 and 27, respectively, whereas none of the treated samples showed any trace of infection. Similar results were obtained with the single lots of other *B.* spp. included in the trials. It thus appears that the regular use of the hot water seed treatment would eliminate this source of infection.

Severin (H. H. P.). **Factors affecting curly-top infectivity of the Beet leafhopper Eutettix tenellus.**—*Hilgardia*, xii, 8, pp. 497–530, 4 pl., 1 fig., 1939.

Investigations carried out over a period of years in California to ascertain the percentage of beet leafhoppers (*Eutettix tenellus*) carrying infection by sugar beet curly top [*R.A.M.*, xviii, p. 225; xix, p. 1] in different areas and different years, and to analyse the factors concerned showed that in the Little Panoche Pass during five years when rain fell in November, inducing early germination of the seeds of pasture vegetation of the uncultivated plains and foothills, the infectivity of the spring generation of leafhoppers ranged from 16 to 42 per cent., while in two years when little rain fell until December or January the figures were 2 to 6 per cent.

A decrease was observed in the percentage of beets infected during

successive 30-day periods by adult hoppers maintained on plants immune from curly top and transferred singly to beets for one day. Many of the infective hoppers appeared to become unable to produce infection. The juices from the immune hosts did not seem to affect the period of infectivity and probably had no effect on the virus.

The additions reported in this paper bring the total number of plants shown to be naturally infected up to 75 species in 48 genera belonging to 18 families. Three species of perennials growing in uncultivated localities were naturally infected, but 16 species of perennials serving as food plants to the hoppers in dry autumns and early winters were not susceptible.

The virus was repeatedly recovered from *Atriplex fruticulosa* during a period of six months, and from *Chenopodium ambrosioides* during a period of one year. Natural infection of *Solanum douglasii* was observed during severe epidemics. The virus was recovered from naturally infected *Pelargonium hortorum* more frequently in spring than autumn. Perennial seedlings, such as *A. lentiformis* and *A. semibaccata*, were highly resistant. The virus was recovered from infected seedlings of *A. lentiformis*, but not from the same plants a year later. Seedlings of *A. semibaccata* were seldom infected, and large, old plants were immune; the virus was not recovered from one of three infected seedlings 23 days after its first recovery. The most favourable weed host virus reservoir was *A. bracteosa*, followed by *A. argentea* subsp. *expansa*, next by *A. rosea*, and lastly by *Salsola kali* var. *tenuifolia*, the virus being recovered from all the infected plants of the first three species, but 18·8 per cent. of the last-named were immune. The virus was transmitted to healthy beet seedlings by single hoppers and lots of ten reared on *Chenopodium murale*, *C. album*, *Suaeda moquini*, and *Rumex crispus*, which attenuate it. Adults reared on these same species inoculated with the virus frequently failed to recover it.

ROLAND (G.). **Onderzoekingen verricht in 1938 over de vergelingsziekte, de zwarte vlekken, de vorming van anthocyaan en de ontleding van zetmeel bij de Biet.** [Investigations conducted in 1938 on yellows, black spots, anthocyanin formation, and the estimation of starch in Beet.]—*Tijdschr. PlZiekt.*, xlv, 5, pp. 181–203, 1939. [French summary.]

The phytopathological studies included in this paper on beet investigations carried out at the Wageningen (Holland) Agricultural College in 1938 have been abstracted from other sources [*R.A.M.*, xix, pp. 185, 186], but the following additional points may be noted: beet yellows was also transmitted by the aphid *Aulacorthum solani* [? *Macrosiphum solanifolii*] to 16 out of 25 beets on which aphids had been placed for two days; and experimental evidence was obtained that anthocyanin development in Demi-Sucrière Géante Rouge Claudia beet was favoured by deficiency of potassium.

STIRRUP (H. H.). **Violet root rot in Sugar Beet.**—*Brit. Sug. Beet Rev.*, xiii, 9, pp. 232–234, 2 figs., 1939.

Violet root rot (*Helicobasidium purpureum*) of sugar beets [*R.A.M.*,

xviii, p. 76, and above, p. 194] is stated to be prevalent in Lincolnshire and other parts of East Anglia, the average number of diseased roots passing an observer at a factory on several occasions being 60 in 20 minutes. A careful study during the last two years of the incidence and distribution of the rot showed it to be most abundant on limestone soils. In 1936 an analysis of the sugar content of infected roots immediately after lifting revealed a reduction of nearly 2 per cent., while in 1937 an increase was observed in the dirt tare (16 as compared with an average of 11 lb. per cwt.). Judging by the results of one experiment, the fungus does not appear to retain its viability after passage through the alimentary canal of sheep. The practice of using 'tailings' (small tails and lateral roots broken off in the washer at the factory) for manure should be discontinued as liable to perpetuate the fungus in the soil.

Proskura (S. S.). Вплив мідних добрив на урожай Цукрового Буряка на осушених торфових грунтах УРСС. [The effect of copper fertilizers on Sugar Beet yield on drained peat soils of the Ukrainian S.S.R.]—*J. Inst. Bot. Acad. Sci. Ukraine, 1939*, 21–22 (29–30), pp. 421–427, 1939. [English summary.]

In field experiments with sugar beet on drained peat soil (with a hydrogen ion concentration of P_H 8·2 to 8·3) in the Supoi Marsh, Soviet Ukraine, an increase in root yield of 3,270 and 5,845 kg. per hect. was obtained in 1937 and 1938, respectively, following a spring application of chalcopyrite [an ore containing sulphide of copper and iron] at a rate of 300 kg. per hect., the increase in the yield of sugar in 1937 being 718·5 kg. per hect. In another experiment carried out at the same place in 1938, a dressing of 450 kg. chalcopyrite per hect. resulted in an increased yield of sugar beet of 6,920 kg. It is concluded that the application of copper fertilizers is beneficial to sugar beet on drained marshes in the Ukraine; a dressing of chalcopyrite at the rate of 450 kg. per hect. is recommended in spring before the soil is prepared for sowing, or one of 300 kg. per hect. during the autumn ploughing.

Chamberlain (E. E.). **Varieties of garden and field Peas immune to Pea-mosaic.**—*N.Z.J. Sci. Tech.*, xxi A, 3, pp. 178–183, 1939.

Of 34 garden and 22 field pea varieties tested in 1936 and 1937 in New Zealand for their reaction to mosaic [*R.A.M.*, xvi, p. 512], using *Myzus persicae* as a vector (supplemented in a few instances by *Aphis rumicis*), twelve of the former and two of the latter group were immune, viz., Autocrat, Daisy, English Wonder, Greenfeast Rogue, Hundredfold, Little Marvel, Lord Chancellor, Lord Chancellor (Tare-leaf), Onward, Royal Salute, William Massey, and William Wonder (garden), and Black-eyed Susan and Mackay (field). An attempt is in progress at the Lincoln Division of Agronomy to develop a pea combining the desirable commercial qualities of Greenfeast with immunity from mosaic, Greenfeast Rogue being used as one of the parents in the crosses.

Virgin (W. J.) & Walker (J. C.). **Relation of temperature and moisture to near-wilt of Pea.**—*J. agric. Res.*, lix, 8, pp. 591–600, 1 fig., 1 graph, 1939.

In experiments conducted in Wisconsin, the causal fungus of 'near

wilt' of peas, *Fusarium oxysporum* f. 8 [*R.A.M.*, xix, p. 2], was grown in potato dextrose agar adjusted to P_H 6·2. The most rapid radial expansion of cultures occurred at 28° C. with an upper and a lower limit for growth at above 36° and below 8°. It was observed in both field and greenhouse trials that generally the symptoms of near wilt were slower to appear than those of wilt (*F. orthoceras* var. *pisi*) [loc. cit.]. The development of near wilt varied with the variety of peas, the disease appearing more quickly in early-blossoming varieties than in late-blossoming ones. In the greenhouse the disease was observed to develop most rapidly at soil temperatures of 24° to 28°, and nearly as rapidly at 20°, while at 16° the development was definitely retarded. Air temperature had little influence on the development of the disease. Pea varieties susceptible to near wilt wilted consistently most rapidly in moist soil, while there was little difference in the rate of wilting in dry and medium-moist soils; in resistant varieties the rate of wilting was distinctly higher in medium-moist soils than in the dry or the wet.

WALKER (J. C.) & MUSBACH (F. L.). **Effect of moisture, fertility, and fertilizer placement on root rot of canning Peas in Wisconsin.**—*J. agric. Res.*, lix, 8, pp. 579–590, 5 figs., 1939.

Marked control of root rot (*Aphanomyces euteiches*) [*R.A.M.*, xvi, p. 510; xix, p. 2] was obtained under greenhouse conditions in Wisconsin in three successive crops of Bruce, Alaska, and Surprise canning peas grown on Colby silt-loam soil receiving one application of 4-16-4 fertilizer at the rate of 500 lb. per acre; an average of 79 per cent. of plants was severely diseased in the unfertilized and only 19 per cent. in the fertilized soil. The effect of the fertilizer was more striking in dry than in moist soil, in accord with observations repeatedly made in central Wisconsin where the disease is rarely found in dry seasons and is usually very destructive in moist ones.

In field experiments conducted on various silt and clay-loam soils in five localities with applications of 2-12-6 and 0-20-10 fertilizers at the rate of 200 or 300 lb. per acre, the greatest increases in yield over the control were obtained when the fertilizer was applied down the same drill spout with the seed, the increase averaging 13·7 to 22·2 per cent. in the non-infested soil, and 46 to 248 per cent. in root rot-infested soils. When the fertilizer was applied about 1½ in. to the side of and at the same level as the seed the yield increased by an average of less than 10 per cent. in the non-infested soil, and varied from a decrease of 14 to an increase of 68 per cent. in infested soil. It appears that quickly available nutrients placed where root development occurs in its early stage enable the plant to build up a greater resistance to the invading root-rot organism. The reduction of root rot and the increases in yield were much greater in plots receiving 2 per cent. readily available nitrogen in the fertilizer than in those from which it was omitted.

WIANT (J. S.). **Species of Phytophthora responsible for market decay of Western Honey Dew Melons and Cantaloups.**—*Plant Dis. Reptr*, xxiii, 19, p. 322, 1939. [Mimeographed.]

All but one of eleven representative isolates of *Phytophthora* from

decaying Honey Dew melons and cantaloupes on the New York market in September, 1938, were determined as *P. capsici* [*R.A.M.*, xvii, p. 157]. One isolate from a cantaloupe from Green River, Utah, was found to be *P. cactorum*.

TEHON (L. R.) & BOEWE (G. H.). **Charcoal rot in Illinois.**—*Plant Dis. Reptr*, xxiii, 19, pp. 312–325, 5 maps, 1939. [Mimeographed.]

Macrophomina phaseoli, first recorded in Illinois in 1926 by G. L. Stout on cowpea [*R.A.M.*, xiv, pp. 208, 670], has since been found 51 times on various wild and cultivated hosts in the same State, including soybean, Korean *Lespedeza*, maize, hemp, *Erigeron canadensis*, *Lactuca scariola*, and *Abutilon theophrasti*. The fungus appears to be almost ubiquitous in the soils of the State, but no evidence has so far been found of strains with specific host preferences. Only one specimen found in Illinois, that collected on cowpea in Jefferson County in 1931, has shown both pycnidia and sclerotia, from which it is concluded that under the local climatic conditions reproduction normally occurs by means of sclerotia, unless a number of collections on cowpea, tentatively identified as *Macrophoma subconica* Ellis & Everh., which bear no sclerotia, should prove to be the pycnidial stage.

Measurements of sclerotia in infected tissues of eight species of plants in Illinois were all, in their means, under the minimum of 120 μ permitted for inclusion in Haigh's group C [ibid., ix, p. 685], indicating their similarity in respect of size to the fungi recorded from other areas as *Macrophomina phaseoli*.

AJROLDI (P.). **Il mosaico del Peperone.** [Chilli mosaic.]—*Riv. Pat. veg.*, xxix, 9–10, pp. 399–422, 10 figs., 1939.

During the past seven or eight years, chilli (*Capsicum annuum*) mosaic [cf. *R.A.M.*, xvi, p. 154] (not previously recorded from Italy, and apparently the same as the disease reported from Spain in 1934 as 'niebla nueva' [ibid., xiii, p. 744]) has become progressively more widespread and severe in the vicinity of Milan, where in some plantings losses of 50 to 70 per cent. are now common.

The first symptoms appear about 30 to 60 (occasionally up to 100) days after transplanting into the field. Large-fruited varieties may show either of two types of mosaic, 'typical aucuba' or 'typical marbling'. The former consists in chlorotic spots often merging into irregular, white to yellowish areas with a darker edge, generally confined to the leaf apex and margins, though sometimes the discoloured parts appear as alternate light and dark concentric rings. In the 'marbling type' the spots are arranged in serpentine lines, frequently starting near the leaf stalk, and discoloration is most uniform and constant near the veins.

Both types of symptoms are accompanied by fleshy, leathery leaf swellings and leaf malformation. Spots are sometimes present on the leaf stalks and young shoots. The symptoms first develop on the youngest leaves, and become progressively more marked until, in some instances, the entire plant appears abnormal within a fortnight. Growth is arrested and even from a distance the affected plants appear pinched, rachitic, and sickly. The crop is reduced to the few fruits that have set

before the onset of the condition, fruits developing later being dwarfed and misshapen. Medium- and small-fruited varieties suffer much less damage as they have completed their growth when attacked. Plants grown wholly or partly under glass are seldom affected.

Histological examination of healthy and mosaic leaves showed that in the latter the palisade cells are isodiametrical, irregular, and often arranged in two or more superimposed layers. The lacunar tissue appears as if parenchymatous. The chloroplasts are less numerous than is normal, arranged in an irregular mass, and poor in chlorophyll pigment. X-bodies are present. In fresh material the mosaic parts of the leaf are thicker than the healthy part.

When healthy chilli plants were inoculated with juice expressed from mosaic chilli plants by rubbing the leaves with cotton wool, pricking the stem and leaf stalks with a lancet, and inserting cotton plugs in the stem, leaf stalks, and shoots, symptoms of chlorosis appeared on 12 out of 90 plants in 15 to 25 days, the symptoms later becoming identical with those observed in the field. Similar inoculation tests on *Solanum nigrum* gave symptoms of 'aucuba mosaic' after 20 days, but negative results were obtained on tomato and potato. Very young chilli plants were shown to be much more susceptible than older plants.

The available evidence strongly suggested that the disease is soil-borne and is favoured by sudden changes in temperature during the night, heavy applications of nitrogenous mineral fertilizers, especially at transplanting, and frequent irrigations with cold water. Control must be sought chiefly in the selection of resistant strains.

HARRIS (M. R.). **A survey of the spotted wilt disease of Lettuce in the Salinas Valley.**—*Bull. Dep. Agric. Calif.*, xxviii, 3, pp. 201–213, 3 figs., 1939.

Since 1935 spotted wilt of lettuce [*R.A.M.*, xvi, pp. 321, 502; xviii, p. 235] has become progressively more destructive in the Salinas Valley, California. In fields formerly unaffected a slight loss is now experienced early in the summer, and as the season advances this loss rapidly increases, until by the beginning of autumn or before, the loss in some plantings amounts to over three-fourths of the crop. As far as is known at present, the only insect vectors found locally are *Thrips tabaci* and *Frankliniella* sp. These are present in large numbers towards the end of summer, but the insect population becomes much reduced when the rains begin. In exceptionally warm years they may be found at all seasons in the open fields.

A survey for weed hosts in January, 1938, showed spotted wilt symptoms present only on an occasional old *Malva* plant. The disease was, however, found on nasturtiums [*Tropaeolum majus*], dahlias, asters, *Zinnia*, *Begonia*, Calla lilies [*Zantedeschia aethiopica*], sweet peas, *Petunia*, tomatoes, peppers [*Capsicum annuum*], endives, broad beans, celery, and peas.

The disease on lettuce was found to appear gradually as spring advanced in fields adjacent to those lightly infected in the preceding winter and in others near localities where perennial hosts had harboured the virus during the winter. Spread extended in all directions from an initial infection, but was very marked away from the direction of the

prevailing wind. Where old lettuce fields were infected and allowed to stand over winter, adjacent young lettuce fields became much more heavily infected in early spring. As the season progressed, lettuces near such sources of winter carry-over were much more heavily infected than lettuces in other places where old, diseased lettuce plants were not allowed to grow through the winter.

For control purposes, the lettuce fields should be ploughed as soon as harvested, ornamental hosts should be removed, cultivation should be practised as far as possible in localities not showing appreciable infection, lettuces should not be planted close to peppers or tomatoes if the lettuces are to be harvested in summer or autumn, and should not be planted in summer or autumn in places adjacent to those used for seed production of ornamental hosts, and old *Malva* plants should be destroyed.

MORSE (W. J.) & CARTTER (J. L.). **Soybeans : culture and varieties.**—*Fmrs' Bull. U.S. Dep. Agric.* 1520, 39 pp., 9 figs., 1 map, 1939.

In the part of this popular leaflet dealing with diseases of the soy-bean the following are discussed. Purple spot of soy-bean seed, ascribed by Japanese investigators to *Fusarium*, *Cercosporina* [*R.A.M.*, ix, p. 23] or physiological factors but the cause of which seems to be still uncertain, has been observed to occur during seasons when rainfall was above normal at the time the seed was maturing, while in normal seasons plants grown from seeds with purple spot showed no signs of disease. The blight diseases caused by *Bacterium glycineum* [ibid., xviii, p. 413] and *Bact. sojae* [ibid., xix, p. 192] are stated to resemble each other so closely that their differentiation in the field is doubtful; mosaic [ibid., xviii, p. 608] was found to be seed-borne, the virus remaining viable in seed after two years; wilt (*F. bulbigenum* var. *tracheiphilum*) [ibid., xvi, p. 585] is most severe on coarse, sandy soils; brown spot disease (*Septoria glycines*) [loc. cit.] may possibly be seed-borne; sunburn or aphid injury is associated with *Alternaria atrans* as a secondary invader; *Peronospora sojae* [ibid., v, p. 471] is widely spread in the United States but has not been serious in any locality; a pod and stem blight caused by *Diaporthe sojae* [ibid., xiii, p. 270] is reported from North Carolina, Indiana, and Delaware; and considerable injury was caused during the summer of 1937 by anthrac-nose (*Glomerella glycines*) [ibid., vi, p. 75] and stem rot (*Sclerotium rolfsii*) [ibid., xvi, p. 585]. Other diseases listed are bacterial pustule (*Bact. phaseoli* var. *sojense*) [ibid., xviii, p. 379], frog eye leaf spot (*Cercospora daizu*) [ibid., xvi, p. 492], and root rot (*Pythium de Bary-anum*) [ibid., vi, p. 75].

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiii, 12, p. 294, 1939.

ARGENTINE REPUBLIC. By Decree No. 31,849 of 26 May, 1939, plants, cuttings, and young fruits of certain [specified] genera of Rosaceae susceptible to fireblight (*Erwinia amylovora*), as well as sugar-cane plants and cuttings, before introduction into the Argentine Republic must be placed in quarantine for a period of observation to be deter-mined in each case, even though the consignment is accompanied by a health certificate.

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HYNES (H. J.) & WILSON (R. D.). **Fungicidal treatment of Pea seed. Beneficial results from dusting.**—*Agric. Gaz. N.S.W.*, l, 12, pp. 657–659, 1 fig., 1939.

To investigate the effect of fungicidal dusting upon the faulty germination of imported pea seed (associated with cracking of the seed coat due to injury and infection by weak parasites), tests were carried out in 1936 in New South Wales in which imported pea seeds were shaken up with various dusts in a container for two minutes, allowed to remain in the packet for 24 hours, and then sown in an experimental plot. After three weeks the seed treated with agrosan 13536 (½ oz. per bush.), cuprous oxide (2½ oz.), and copper carbonate (2 oz.) showed, respectively, 48, 50, and 58 per cent. germination, as against 36 per cent. for the untreated control [cf. *R.A.M.*, xviii, p. 495]. In 1937–8, seed similarly treated with cuprous oxide (2½ oz.), copper carbonate (2 oz.), agrosan 13536 (½ oz.), agrosan 14836 (2 oz.), agrosan RD 7312 (2 oz.), ceresan 3657 (½ oz.), and ceresan 3779 (½ oz.) gave, respectively, 46, 53, 51, 45, 55, 45, and 58 per cent. germination, as compared with 25 per cent. in the control. When excess dust was used (in 1939) ceresan U.T. 1875a gave 54 per cent. germination, as against 23 per cent. for the control, while in another test cuprous oxide (samples *a*, *b*, and *c*), ceresan U.T. 1875a, and agrosan 14836 gave, respectively, 37, 53, 49, 37, and 23 per cent. germination, as against 21 per cent. for the control. In a further test, cuprous oxide (samples *b* and *d*), copper carbonate, copper oxychloride, and ceresan U.T. 1875a gave, respectively, 84, 82, 88, 87, and 85 per cent. germination, as against 73 per cent. for the control. When used in excess, agrosan 14836 and one sample of cuprous oxide had a rather stunting effect on the plants, while agrosan 13536 caused stunting and reduction of germination.

It is concluded that although no increase in stand may follow the dusting of good seed, treatment is well worth the trifling cost involved, as a precaution against bad stands. The treatments recommended are (in descending order of preference): copper carbonate (2 oz.), cuprous oxide (sample *b*, 2½ oz.), and ceresan U.T. 1875b (1½ oz.).

LAMBERT (E. B.). **Notes on the establishment and maintenance of truffières (Truffle orchards).**—9 pp., U.S. Dep. Agric., Bur. Pl. Ind., 1939. [Mimeographed.]

Based mainly on recent French contributions to the literature of the subject, these brief, practical notes on the cultivation of the Périgord

truffle (*Tuber melanosporum*) [*R.A.M.*, vii, p. 423; xiv, pp. 420, 783] deal with such points as soil inoculation, choice of site, soil texture, reaction, and drainage, selection of truffle-bearing trees (of which the best in colder localities are *Quercus pedunculata* and *Q. sessiliflora*, and in warmer ones *Q. ilex* and *Q. coccifera*), seedling propagation, the setting out of the young trees, irrigation, fertilization, pruning, and the harvesting of the crop.

THOMAS (K. M.). **Detailed administration Report of the Government Mycologist, Madras, for the year 1938–39.**—30 pp., 2 graphs, 1939.

This report on plant disease work in Madras during 1938–9 [*R.A.M.*, xviii, p. 88] contains the following items of interest. In field studies with 36 strains of rice the departmental strains Co 2, Co 7, Co 9, Co 10, Adt 3, Mtu 5, and Mtu 9 all proved susceptible to *Piricularia oryzae*; Adt 6 was the most resistant and Co 4 and Co 11, hitherto regarded as resistant, showed 12 and 17 per cent. infection, respectively. In monthly sowings from September to December, the later plantings suffered less than the earlier ones. When diseased material was stored in pulverized rice soil, pulverized farmyard manure, and dry blotting paper, the fungus remained viable for 13 months.

Helminthosporium tetramera [*Curvularia spicifera*: ibid., xvi, p. 735] obtained from rice failed to produce infection when inoculated on to rice leaves, stems, and ear heads, though in similar tests *H. oryzae* [*Ophiobolus miyabeanus*] gave positive results in 48 hours.

When barley, oats, wheat, cholam [sorghum], cumbu [*Pennisetum typhoides*], ragi [*Eleusine coracana*], tenai, and maize seedlings were cross-inoculated with *C. spicifera*, *H. nodulosum* [ibid., xviii, p. 185], and *H. sativum*, *C. spicifera* failed to produce any infection, *H. sativum* and *H. nodulosum* infected barley, oats, wheat, *P. typhoides*, *E. coracana*, tenai, and maize, and sorghum was not infected by any of the three species. When cross-inoculations were made on the leaves and ear heads, *C. spicifera* failed to infect *E. coracana* and wheat, while *H. nodulosum* and *H. sativum* infected both these hosts. In the course of a cultural study of these fungi it was found that the optimum growth temperature for all was near 30° C. and that although the growth of *O. miyabeanus* and *H. sativum* was completely checked at 36·5° *H. nodulosum* and *C. spicifera* were able to grow at that temperature.

Among the results of a detailed comparative cultural and pathogenicity study of *Phytophthora arecae* from areca palm with strains of *P.* from Palmyra palm [*Borassus flabellifer*], citrus, tobacco, and betel vine [*Piper betle*] it was found that *Trichoderma lignorum* was antagonistic to all these fungi. The optimum growth temperature of the *Phytophthora* associated with betel vine [*Piper betle*] wilt [ibid., xviii, p. 437] was about 30°; no growth occurred at 15° or 35°.

Germinating horse gram [*Dolichos biflorus*] seeds transferred to soil inoculated with *Macrophomina phaseoli* showed only a small percentage of infection, but when germinating seedlings were inoculated in the radicle and transferred to soil, 50 to 66 per cent. infection resulted, as against 17 to 33 per cent. by other methods. The length of the root system in healthy and diseased seedlings was, respectively, 8·7 to 13·7 and 1·5 to 2·85 in. *M. phaseoli* grew best at about 37°, growth rate

increasing as the temperature rose from 8° to 37°. The pathogenicity of *M. phaseoli* was completely checked in the presence of *T. lignorum*, and its growth retarded by filtrates from liquid cultures of the latter.

The best growth of the fungus causing *E. coracana* blast (*Piricularia* sp.) [cf. ibid., xvii, pp. 295, 454] in culture took place between P_H 5 and 6·4; during growth this value tended to shift to P_H 6. The optimum growth temperature was about 29·5°, and the thermal death point of the conidia (5 minutes' exposure) between 48° and 49°.

Sucrose was the best source of carbon, and asparagin, peptone, and potassium nitrate were good sources of nitrogen for *Colletotrichum falcatum* [ibid., xviii, p. 625], which made poor growth when supplied with starch or ammoniacal nitrogen and was unable to utilize cellulose or potassium nitrite. Spore size was affected by the nitrogen source. With different carbon/nitrogen ratios, the greatest dry weight of mycelium was obtained at 5/1, growth gradually diminishing as the proportion of carbon was reduced. The optimum, minimum, and maximum temperatures for the original isolation and a lighter-coloured saltant were, respectively, about 32·5°, 10°, and 37·5°.

Cross-inoculations with *C. indicum* [ibid., xiii, p. 683] from diseased cotton bolls on plants belonging to genera other than *Gossypium* gave positive results only on wounded chilli fruits. Delinted cotton seeds soaked in a spore suspension of *C. indicum* and sown in germination trays gave 24 per cent. germination, as against 80 per cent. for the uninoculated controls. Inoculated seeds sown in sterilized soil also showed reduced germination, and the seedlings that emerged were diseased. Evidence was also obtained that the disease may be carried through the soil. The fungus grew well on media containing sucrose, maltose, or glucose, and readily utilized nitrogen in the form of asparagin, peptone, or potassium nitrate. As the proportion of carbon to nitrogen declined, so growth was reduced, the optimum occurring near 32°. Cotton seedlings placed in a filtrate of the fungus wilted.

T. lignorum suppressed colonies of *Pythium* spp. from ginger soft rot when the organisms were grown together. In mixed cultures, *T. lignorum* so increased the acidity of the medium that it became unfavourable to the growth of *Pythium*.

Zinc sulphate sprays were successfully applied against mottle leaf of Nagpur Santhra tangerine, Kodur Cheeni and Batavian oranges, and pomelo (*Citrus decumana*) [*C. maxima*: ibid, xviii, p. 308].

The sugar-cane variety Co 205 was again resistant to mosaic, while Co 434, Co 511, and Uba A were unaffected. In three years' trials Co 434 has consistently shown high resistance. Co 511 was resistant throughout two years' trials.

Five apparently different tobacco mosaic strains were distinguished.

Of 36 brinjal [eggplant] varieties tested under natural conditions all were susceptible to little leaf, which was transmitted by grafting to tomato, tobacco, *Datura fastuosa*, *Solanum xanthocarpum*, *S. torvum*, *S. trilobatum*, and a wild variety of eggplant. Successful transmissions were obtained with the jassid *Eutettix phycitis* and, less consistently, with *Empoasca devastans*.

Paul (W. R. C.). **Report on the work of the Division of Plant Pathology.** —*Adm. Rep. Dir. Agric. Ceylon, 1938*, pp. D41–D45, 1939.

In this report on plant disease work in Ceylon in 1938 [cf. *R.A.M.*, xviii, p. 655], it is stated that a root disease of lime (*Citrus aurantiifolia*) caused by a species of *Rosellinia* was reported for the first time; no fructifications were noted, but from the characters of the fungus as seen on the roots it appeared to resemble *R. bunodes*. Specimens of scab lesions on rough lemon leaves submitted to Dr. Anna Jenkins for identification were considered by her to suggest infection by *Sphaceloma fawcettii scabiosa* [ibid., xvi, p. 527]. Small, brown to orange, corky lesions on two grapefruits were identified by Fawcett and Miss Jenkins as sour orange scab [*Elsinoe fawcetti*]. Citrus leaves from a dry locality bore small, silvery spots, which developed first on the upper surface and in older leaves on the lower surface as well, these symptoms resembling those due to manganese deficiency.

Experimental evidence showed that roguing and the application of farmyard manure or sulphur were all ineffective against tomato bacterial wilt (*Bacterium solanacearum*), but that late transplanting did not aggravate the disease.

Other diseases that occurred included root disease (*Poria hypolateritia*) of *Tephrosia vogelii* [ibid., xvi, p. 635], stem disease (*Colletotrichum piperis*) and leaf spot (*Bacterium betle*) of betel (*Piper betle*), and twig disease (*C. incarnatum*) of coffee [ibid., ii, p. 7]. Among new records are cited root disease of *Coffea* sp. due to *P. hypolateritia* and stem disease of soy-bean caused by *Rhizoctonia bataticola* [*Macrophomina phaseoli*]. No authentic cases of cassava mosaic have so far been reported.

Ward (F. S.). **Annual Report of Plant Pathologist for 1938.**—*Rep. Dep. Sci. & Agric. Jamaica, 1938*, pp. 90–93, [? 1939. Received February, 1940.]

In this report on plant disease work in Jamaica in 1938 [cf. *R.A.M.*, xviii, p. 92] it is stated that in spraying tests against banana leaf spot (*Cercospora*) [*musae*: ibid., xviii, p. 328] promising results were obtained with perenox ($\frac{1}{4}$ to $\frac{1}{2}$ per cent.). Where, largely owing to unfavourable weather, control was inadequate, satisfactory results ensued when the applications were made at intervals of two, instead of three, weeks, for a short period. For ratoons, the rate of application was temporarily standardized at 200 gals. per acre, and for young plants at 100 to 150 gals. per acre. On many demonstration plots dusting gave unsatisfactory results, and spraying has been adopted. Owing to the difficulty of manipulating spraying machines with tanks on wheels in some areas, many of the machines have been adjusted so that the engine and pump can be detached and carried by two men from barrel to barrel of spray mixture.

When banana stems from healthy plants and plants affected with *C. musae* were stored at 52° to 53° F. for 14 days and then ripened for 7 days, the fruit from the affected trees compared favourably, as regards normal ripening and flavour, with that from the healthy trees, but the stems from the affected trees showed more thin and short fingers than the stems from the healthy trees.

During 1938, 854,897 banana plants were found to be affected with Panama disease [*Fusarium oxysporum* var. *cubense*], as compared with 800,959 in 1937, an increase of 6½ per cent.

Groundnuts in isolated areas were affected by *Puccinia arachidis* [ibid., xviii, p. 141]. A serious reduction in pimento (*Pimenta officinalis*) yields has been caused by *P. psidii* [ibid., xvii, p. 554] at altitudes over 2,000 ft. but no material harm has been done below 1,000 ft. Sugar-cane leaf spot (*Cercospora vaginae*) [ibid., xviii, p. 624] was occasionally noted on the variety BH 10–12. Coffee growing in the Blue Mountain area was slightly affected during rainy periods by *Omphalia flavida* [ibid., xviii, p. 589]. White and yellow yams (*Dioscorea alata* and *D. cayennensis*, respectively) were attacked by a leaf spot apparently due to *Gloeosporium pestis* [ibid., xv, p. 137].

WORTLEY (E. J.). **Trinidad and Tobago. Administration Report of the Director of Agriculture for the year 1938.**—85 pp., 1939.

This report [cf. *R.A.M.*, xvii, p. 728] contains (pp. 8–13) the following items of phytopathological interest. Witches' broom of cacao [*Marasmius perniciosus*: see below, p. 266] was controlled on the Marper Estate at a cost of $5.19 per acre, not allowing for supervision. In continued trials to find disease-resistant trees, only a few of the 150,000 critically examined still gave evidence of resistance. Panama disease of bananas [*Fusarium oxysporum* var. *cubense*] continued to increase, and leaf spot [*Cercospora musae*] has made rapid headway all over Trinidad, little control work being carried out against either disease. Grapefruit scab [*Elsinoe fawcetti*], which up to the early part of the year was only found in the Santa Cruz and Maraval Valleys, has since been discovered in a mild form in various parts of the island. A survey made on all plantations in the island (involving 232 properties with a total of 209,752 trees) showed that 23 properties with a total of 3,176 trees were affected. Spraying experiments in Santa Cruz gave encouraging results.

WIEHE (P. O.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1938*, pp. 34–39, 1939.

In this report on plant disease work in Mauritius in 1938 [cf. *R.A.M.*, xviii, p. 374] the author states that the three major tobacco diseases present are black shank [*Phytophthora parasitica* var. *nicotianae*], mosaic, and Granville wilt [*Bacterium solanacearum*]: in one district a serious outbreak of wilt developed in a field that had been allowed to lie fallow since being infected six years before. Enation mosaic occurred in four plantations. Seven distinct types of tobacco mosaic symptoms have now been observed in Mauritius.

Experimental evidence demonstrated conclusively that pineapple wilt [cf. ibid., xvii, p. 300] is due locally to attack by the mealy bug *Pseudococcus brevipes*.

An outbreak of pigeon pea wilt at the central experiment station was found to be due to *Gibberella fujikuroi* var. *subglutinans*.

New records included loquat die-back (*Corticium salmonicolor*).

SYMOND (J. E.). **Report on the Department of Agriculture, Gold Coast, for the years 1937–39.**—22 pp., 1939.

In view of Dade's report on cacao swollen shoot in the Gold Coast

[*R.A.M.*, xvii, p. 224], a campaign of reafforestation and the restoration of shade and shelter was undertaken in the area concerned. By April, 1938, 25 nurseries had been established in the affected zone with stocks of local and exotic trees, and 750,000 seedlings were available for planting in 1939. Symptoms have not yet appeared in the Central Province, but the need to replace shade and shelter in this area is recognized. No evidence has yet been obtained that any parasitic organism is associated with the disease, but it has been noted that the condition occurs on well shaded and sheltered trees showing no die-back, though usually in the vicinity of die-back trees.

The continued export of Cavendish bananas having become economically impracticable, the decision was made in 1938 to change to Gros Michel. Panama disease [*Fusarium oxysporum* var. *cubense*] was found in the Nsuaem area. Treatment and precautionary measures were prescribed under the Plant Pests and Diseases Ordinance No. 30 of 1937, planting was suspended, a survey made, and a quarantine put on the affected farms. There is every reason to hope that spread has been arrested and that infection is confined to a comparatively small area.

Further investigations into root rot of coco-yams (*Colocasia* [*antiquorum*] and *Xanthosoma* [*sagittifolium*]) have so far failed to show the presence of any suspected parasites, except *Rhizoctonia* [*Corticium*] *solani* and *R. melongenae*, and pot tests of the parasitism of these fungi gave negative results. Experimental evidence, however, demonstrated the toxic effect on the growth of the plant of soil from a diseased farm, this effect being, apparently, destroyed by heat sterilization.

Tobacco was affected by leaf curl, and (at Kpeve) by black shank (*Phytophthora parasitica* var. *nicotianae*). The Sterling tobacco variety, reputedly resistant to leaf curl, is being introduced from East Africa. At two centres tobacco was attacked by collar rot (*Pythium aphanidermatum*), and attempts are being made to control the disease by seed-bed treatments. Citrus fruits were affected by scab [*Elsinoe fawcetti*] and the requisite control measures enforced.

Yu (T. F.). **A list of important crop diseases occurring in Kiangsu Province (1934–1937).**—*Lingnan Sci. J.*, xix, 1, pp. 67–78, 1940.

Most of the diseases enumerated in this survey of pathogens of economic crops in Kiangsu Province, China, from 1934 to 1937 are well known, but mention may be made of the following: *Sclerotinia miyabeana* on groundnuts [*R.A.M.*, xiii, p. 615], downy mildew (*Plasmopara nivea*) on carrots, *Pestalozzia congensis* P. Henn. causing leaf and fruit spot of loquats, leaf spot of orange (*Coniothecium citri* [cf. ibid., iii, p. 211], peach anthracnose (*Gloeosporium laeticolor*), fruit rots of pear (*Leptosphaeria pomona* and *Macrosporium pirorum*), and sorghum stripe (*Ramulispora andropogoni* Miura).

Faes (H.). **Station fédérale d'essais viticoles et arboricoles à Lausanne et Domaine de Pully. Rapport annuel 1938.** [Annual report for 1938 of the Federal Viticultural and Arboricultural Station at Lausanne and Domaine de Pully.]—*Annu. agric. Suisse*, xlv, 1, pp. 1–26, 7 figs., 1940.

The following items of phytopathological interest occur in this report

[cf. *R.A.M.*, xvii, p. 375]. Vine anthracnose (*Gloeosporium*) [*Elsinoe ampelina*: ibid., xviii, p. 502] appears to be increasing in severity on American stocks. The development of *Coniothyrium* [*diplodiella*] on artificially infected Chasselas and various types of Gamay and direct bearer grapes suggest that the resistance of these varieties to the attacks of the fungus in nature is due to the mechanical protection against hail afforded by the skins. Satisfactory control of vine diseases was achieved by the following schedule: two prophylactic applications of 15 per cent. lime-sulphur against *Oidium* [*Uncinula necator*]; one against court-noué [ibid., xix, p. 66] (10 per cent. lime-sulphur); five against downy mildew [*Plasmopara viticola*] of 1·5 to 2 per cent. Bordeaux mixture with an adhesive, and four supplementary treatments at 1·5 per cent.; and two applications of sulphur and sulphostite against *U. necator*.

None of the preparations so far tested for the control of apple mildew (*Podosphaera*) [*leucotricha*], the local incidence of which is steadily increasing [ibid., xvii, p. 375], has proved effectual. Apple and pear scab (*Venturia*) [*inaequalis* and *V. pirina*] were successfully combated by spraying with carbolineum in March, lime-sulphur and lead arsenate at the beginning of April and end of June, copper oxychloride and lead arsenate in July, and copper oxychloride alone in August.

Shot hole of cherries (*Clasterosporium carpophilum*) yielded to a dormant application of carbolineum, followed before the blossom by a blue copper oxychloride spray [ibid., xix, p. 26].

During the summer peaches in open situations received three applications of lime-sulphur, and espaliers three of a mixture of flowers of sulphur and talc against *C. carpophilum* [ibid., xix, p. 104] with good results, the number of 'gummy' fruits being very small. Peach leaf curl [*Taphrina deformans*] was well controlled by one treatment with 3 per cent. Bordeaux mixture.

GHIMPU (V.). **Sur les affections pathologiques et insectes nuisibles aux plantes cultivées en Roumanie.** [On the pathological conditions and injurious insects affecting cultivated plants in Rumania.]—*C.R. Inst. Sci. Roum.*, iii, 5, pp. 511–513, 1939.

In these notes on plant diseases in Rumania in the spring of 1939 the author states that the basal leaves of wheat were attacked (as they are every year) by *Septoria tritici* [*R.A.M.*, xvii, p. 383]. Some leaf-spotting of oats was caused by *Helminthosporium avenae* [ibid., xvii, p. 809] and *Phytomonas* [*Bacterium*] *coronafaciens*. *Begonia* plants in glasshouses were attacked by collar rot (*Asterocystis radicis*) [*Olpidium brassicae*: ibid., xviii, p. 821].

RADA (G. G.). **Departamento de Fitopatología. Memoria del Jefe de la Sección Fitopatología.** [Department of Phytopathology. Memorandum of the Head of the Section of Phytopathology.]—*Mem. Estac. exp. agric. Soc. nac. Agr., Lima*, 11a, pp. 233–284, 3 diags., 7 graphs, 1939.

Neither delayed irrigation nor applications of ammonium sulphate to the soil reduced the percentage of cotton wilt (*Verticillium* sp.) in the final counts in experiments in 1937–8 at the La Molina Agricultural Experiment Station, Lima, Peru [*R.A.M.*, xix, p. 212], though the

former treatment resulted in a diminution of infection during the growing period which was most marked (19·4 per cent.) in the Pariache variety.

Black and yellow rusts of wheat (*Puccinia graminis* and *P. glumarum*) were prevalent at the Station in 1938 [ibid., xvi, p. 520], when observations were made, mostly in October, on varietal reactions to both diseases. On 25th August Thatcher was observed for the first time to be attacked by *P. graminis* [ibid., xix, p. 10]. A very high degree of resistance to black rust was shown by the prolific Australian variety Kenya Crossbred C.6040, with only 10 per cent. of barely perceptible infection, and also by 38 M.A.×San Martín 28 (Argentine), with a similar response, in contrast to the two Italian varieties Ciro Menotti and Mentana both of which were attacked to the extent of 100 per cent. Among a number of foreign varieties and strains tested for the first time in Peru, the most promising in respect of resistance to black rust included Thatcher Backross II–30–4 and II–30–5, Thatcher 10003, H–44×Marquis 11781, and a number of crosses between H–44 and Thatcher and H–44 and D.C., all of American origin. Thatcher, Pentad (durum) 3322, and Hyper all gave substantial fields notwithstanding infection by *P. graminis* (slight in the first and severe in the two others).

Among the varieties showing marked freedom from yellow rust were the above-mentioned Kenya Crossbred C.6040, two strains of Apex, H–44×Thatcher II–29–76, H–44×D.C. II–2–7, II–28–19, Power 3967, Schlanstedt 4646, Garnet 8181, Rouge prolifique 11774, Providence, and Heine's Club, while a satisfactory standard of resistance was maintained by a large number of others, including crosses between H–44 and selections of Marquis, Ceres, Reward, Thatcher, and Reliance, Haynes Bluestem, Thatcher 10003, Renown, Ridit, four strains of Iumillo White, New Zealand 6011, Sonora 3036, and Loros 3779. On the other hand, Power 3697, Garnet 8181, Apex 11636, and H–44× Thatcher II–29–76 were highly susceptible to *P. glumarum*.

Of the 13 varieties of oats tested, Victoria, Bond, and Glabrota proved immune from crown rust (*P. coronata*), combined in the two first-named with freedom from smuts [*Ustilago avenae* and *U. kolleri*]. Resistance to *P. coronata* was shown by Fergusson, Fulghum, Rainbow, and Anthony, to *P. graminis* by Hegira, White Tartar, Richland, Iogold, and Rainbow [ibid., xix, p. 206], and to the smuts by Navarro and Markton. The two American barley varieties included in the trials, namely, California Mariout and Wisconsin Barbless were both slightly infected by black rust.

Details are given of experiments in the control of *P. graminis* on Mentana and Marquis wheats by dusting with asporital [ibid., xvii, p. 227] at the rate of 50 kg. per hect., from the results of which it appears that the former variety was entirely unaffected by the treatment, whereas the latter responded by a slight improvement in yield, though the incidence of infection was not reduced.

Sorghum mosaic [ibid., xviii, p. 517], observed for the first time at the Station in March, 1938, spread to the adjacent sugar-cane plantations, also hitherto unaffected, no doubt through the agency of *Aphis maidis*. Inoculation experiments on healthy sorghum plants with juice

from diseased ones gave positive results. The virus does not appear to be seed-borne, since plants raised from the seed of infected individuals remained free from symptoms.

Of the seven mosaic-resistant American potato varieties tested for their adaptability to Peruvian conditions, only two, Katahdin and Sebago [ibid., xvii, p. 302; xviii, p. 544], gave results of any interest from this point of view. A project for the introduction of the seed certification system into Peru has been initiated. The outcome of preliminary experiments in the control of potato blight (*Phytophthora infestans*) by (*a*) standard Bordeaux mixture (1–1–100) and (*b*) a modified formula (1–½–100) denoted that the latter is more conducive to normal foliar development than the former, the larger amount of calcium in which tends to coarsen the leaves, as already noted by Horsfall in the United States.

The following diseases were observed during 1938 for the first time in Peru: *Sphaeronema fimbriatum* [*Ceratostomella fimbriata*] on sweet potatoes, *Cercospora personata* [ibid., xix, p. 62] on groundnuts, *Pestalozzia theae* and *Cephaleuros mycoidea* on tea, *Peronospora effusa* [loc. cit.] on quinoa [*Chenopodium quinoa*], and *Puccinia graminis* on various species of barberry, including *Berberis divaricata*.

WALDEE (E. L.), KENT (G. C.), & MELHUS (I. E.). **Classification and nomenclature of some phytopathogenic species of Bacillus.**—Abs. in *Phytopathology*, xxx, 1, p. 26, 1940.

At least three well-marked generic groups were differentiated on the basis of a preliminary study of 46 cultures of reputedly phytopathogenic species of *Bacillus*, using the 1934 descriptive chart of the Society of American Bacteriologists for the determination of taxonomic status. Three species, formerly known as *B. amylovorus*, *B. tracheiphilus*, and *Bacterium salicis* [*R.A.M.*, xvii, p. 356], constitute one group, the second is occupied by the soft rot bacteria (24 isolates), and the third by two isolates designated *B. lathyri*. Group I represents a generic group based on the type species, *Erwinia amylovora*, and also includes *E. tracheiphila* and *E. salicis* (Day) Bergey *et al.*, 1939 [ibid., xix, p. 203]. Group II, comprising the soft rot organisms, belongs to the coliform bacteria, with which it should be classified in a new genus in the tribe Escherichiae, as proposed by Bergey and associates. The systematic position of the two species of bacteria falling within the limits of group III requires further elucidation.

ARK (P. A.). **Relation of reducing substances to longevity and virulence of phytopathogenic bacteria.**—Abs. in *Phytopathology*, xxx, 1, p. 1, 1940.

The duration of life of *Erwinia amylovora*, *Phytomonas* [*Bacterium*] *malvacearum*, *P.* [*Bact.*] *pisi*, and *P.* [*Aplanobacter*] *stewarti* was prolonged by the incorporation with the potato dextrose-peptone agar medium on which these organisms were grown of vitamin C (1 : 200 to 1 : 1,000,000), cysteine (1 : 1,000), glutathione (1 : 1,000), pyrogallol (1 : 1,000), resorcinol (1 : 10,000), and tannic acid (1 : 100 to 1 : 10,000). The added viability thus conferred was found to be retained by the bacteria for some time after transference to substrata devoid of the

reducing substances. *E. amylovora*, for instance, lived for six months instead of a fortnight when transferred to a plain potato dextrose-peptone agar medium after two months in the presence of vitamin B (betoxin, 15 mg. per l.) or resorcinol. The virulence of the pathogen diminished after one to four months on the nutrient medium plus the reducing agent, but was rapidly restored by transference to a substratum of a very low reduction potential or with no reducing agent.

MATSUMOTO (T.). **Phage-produced resistant strains of Bacillus aroideae. I. Resistant strains appeared in culture solutions.**—*Trans. nat. Hist. Soc. Formosa*, xxix, 195, pp. 317–338, 1939.

It was found that the bacteriophage specific for *Bacillus* [*Erwinia*] *aroideae* from radishes can be satisfactorily prepared by 30 minutes' heating of phage-bacteria mixture at 60° C., instead of by ultrafiltration, the method used in the author's previous experiments [*R.A.M.*, xviii, p. 162]. The maximum accumulation of the bacteriophage is usually reached after an incubation period of 18 to 30 hours at 31°, whereupon a gradual diminution ensues, the lytic action being barely perceptible after ten days.

Two forms of *E. aroideae* (tentatively designated M and F) are distinguished. The former is characterized by colonies with reticulate markings and the latter by fluid, unmarked ones: no conspicuous differences in sensitivity to the bacteriophage were observed between them. The so-called 'bacteriophage-resistant' strains usually develop in the phage-bacteria mixtures within 12 hours at 31°, gradually multiply, and after 24 hours the ordinary forms are outnumbered. No definite correlation could be established between bacteriophage-sensitivity and agglutinability in *E. aroideae*, since the conversion of the normal form of the organism into resistant strains does not necessarily entail loss of agglutinability in the antiserum in dilutions up to 1 in 400. Little or no relation, moreover, appears to exist between the acquisition of resistance to the bacteriophage and the pathogenicity and fermentative activity. The bacteriophage-susceptible strains occurring in the later stages of incubation are thought to be possibly variants arising from the resistant forms after the decline or loss of the lytic activity.

POUND (F. J.). **Witches' broom resistance in Cacao.**—*Trop. Agriculture, Trin.*, xvii, 1, pp. 6–8, 1940.

In this paper, prepared for the Imperial Mycological Conference of 1939, which had to be abandoned on account of the war, the author summarizes the results of recent travels in South America [*R.A.M.*, xvii, p. 801] in search of cacao resistant to witches' broom caused by *Marasmius perniciosus* [see above, p. 261]. This disease is stated to have appeared in Tobago quite recently. The following practical questions arise from the author's observations. Should resistant cacao in future be grown with as little overhead shade as possible, as suggested by the lack of infection, in some varieties at least, in full sunlight? Is altitude an ecological factor retarding the rapid spread of the disease (e.g. in the Northern Range, Trinidad), possibly through inability of the parasite to thrive at high altitudes? Thirdly, are the types of cacao

on the upper Amazon, found uninfected even under shade, completely immune or not?

ANDRÉN (F.). **Några resultat från betningsförsök.** [Some results of disinfection experiments.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1939*, 4–5, pp. 75–82, 1939.

A tabulated account is given of laboratory and field experiments in the disinfection of cereal seed-grain against various fungal diseases carried out at the Swedish Plant Protection Institute, Stockholm, in 1939 [cf. *R.A.M.*, xiv, p. 21]. The best control of rye fusarioses (including snow mould [*Calonectria graminicola*]) was obtained by the following treatments: dusting with uspulun [ceresan] U.T. 1875b at the rate of 150 gm. per kg. (which reduced the percentage of infection from 45·4 to 8·4), the same at 200 gm. (5·2), abavit-neu at 150 (6) and 200 gm. (6); 30 minutes' immersion in 0·125 per cent. abavit (5·6), 0·25 per cent. abavit (4·8), 0·125 per cent. germisan (8·8), 0·25 per cent. germisan (8·4), in 0·25 per cent. fusariol 157 (5·6) [ibid., xv, p. 83], and 0·1 per cent. germisan retorte (5·2); and sprinkling with abavit (8·4), fusariol 157 (7·2), and gefa retorte (5·6), each used at a strength of 50 gm. per 3 l. Fusarioses of white oats [*Fusarium* spp.] were effectively combated by all the treatments applied, the incidence of infection being reduced from 68 to 7·6 per cent. by ceresan dust U.T. 1875b (300 gm.), to 6·4 per cent. by uspulun sprinkle, to 5·6 per cent. by uspulun liquid (0·25 per cent., one hour's immersion), to 1·2 per cent. by germisan dust (300 gm.), to 4·8 per cent. by germisan retorte (0·25 per cent., 30 minutes' immersion), and to 4·4 per cent. by gefa retorte, while the average of germination was raised from 77·2 to 91·3 per cent. The results with spring wheat were less satisfactory, the two best treatments (germisan dust, 200 gm. and an unnamed Swedish disinfectant, 175 gm.) leaving residues of 13·6 and 14 per cent. fusariosis, respectively, as against 52 per cent. in the control lot. The highest increases in the yield of white oats were obtained from uspulun liquid and gefa retorte treatments (each 3,340 kg. seed-grain per hect. as compared with 1,650 untreated), while germisan retorte (0·25 per cent., 30 minutes' immersion) gave the strongest stimulus to spring wheat (2,490 kg. seed-grain per hect. as against 2,110 untreated and 2,430 for germisan dust).

All the preparations reduced the incidence of bunt in winter wheat [*Tilletia caries* and *T. foetens*] from 28·6 to less than 1 per cent., but absolute freedom from infection was obtained only by the use of uspulun and tutan dust (200 gm.), and 0·125 per cent. uspulun, abavit, fusariol, and germisan liquid (30 minutes). Flag smut of rye [*Urocystis occulta*] was effectively combated by all the treatments, only 0·125 per cent. germisan liquid and abavit sprinkle leaving a trace of infection.

The incidence of barley stripe [*Helminthosporium gramineum*] was reduced from 25·5 to a fraction of 1 per cent. by uspulun, abavit-neu, germisan dusts, all the standard liquid treatments, and uspulun sprinkle.

Complete elimination of loose smut of oats [*Ustilago avenae*] was secured only by 15 minutes' immersion in 0·25 per cent. uspulun or germisan plus 0·1 per cent. formalin, but reductions from 3·8 (untreated) to under 1 per cent. were obtained by dusting with uspulun or abavit-neu, half-an-hour's or an hour's immersion in 0·25 per cent. uspulun,

germisan, abavit, or germisan retorte, one hour in 0·25 per cent. fusariol 157, 15 minutes in 0·1 per cent. mercuric chloride-formalin or fusariol 157 plus 0·1 per cent. formalin (only 0·03 per cent. infection in each case), 15 minutes in 0·25 per cent. germisan retorte plus 0·1 per cent. formalin, and sprinkling with abavit and gefa.

BORZINI (G.) & MARINI [BETTÒLO] (G. B.). **Composti furanici e mercuri-furanici come anticrittogamici nazionali.** [Furfuran and mercuri-furfuran compounds as national fungicides.]—*Ric. sci. Progr. tec. Econ. naz.*, Ser. 2, x, 5, p. 474, 1939.

The satisfactory results obtained in preliminary experiments at the Phytopathological Station of Rome University with furfuran derivatives, especially of the chloromercuric group, in the control of wheat bunt (*Tilletia tritici*) [*T. caries*: cf. *R.A.M.*, iv, p. 32; vi, p. 568; xi, p. 296, *et passim*] encourage the hope of their application on a large scale in Italy. Even at low concentrations the compounds tested were toxic to the fungus and stimulatory to the initial growth of the wheat. In addition to these advantages another important factor is the home production both of furfurol and mercury. Further trials are in progress to determine the optimum concentrations of the substances for the purpose in view.

[An expanded account of these studies appears in *Boll. Staz. Pat. veg. Roma*, N.S., xix, 4, pp. 347–452, 1 fig., 1939. (Issued March, 1940.) [English summary.]

ZAZHURILO (V. K.) & SITNIKOVA (Mme G. M.). **Mosaic of winter Wheat.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxv, 9, pp. 798–801, 1 fig., 1 map, 1939.

Mosaic of wheat [*R.A.M.*, xvii, p. 436; xviii, p. 297] is stated to have been recorded lately from many parts of the U.S.S.R., chiefly from the central regions, but also the south, including almost all provinces in which winter wheat is grown. The disease is most prevalent in the Voronezh province, where it occurs each year, attacking under favourable conditions up to 15 to 20 per cent. of the plants and reducing the yield by 40 to 80 per cent. The diseased plants show necrosis of the phloem, under-development and reduction of the plastids, nuclear hypertrophy and an increase in the number of nucleoli, and the formation of vacuolar inclusions within the cells. The content of starch and soluble carbohydrates was higher in diseased plants (4·97 and 17·13 per cent., respectively, of the dry weight) than in healthy ones (2·82 and 14·24 per cent.), but the amount of nitrogen was the same. All attempts to transmit the virus by mechanical means were unsuccessful. In transmission experiments with insects *Deltocephalus striatus*, fed first upon diseased plants and then upon healthy ones, transmitted the disease to 56 out of 60 plants in one experiment, to 29 out of 123 in another, and to 32 out of 41 in a third, the incubation period being 15 to 18 days. A comparison of the disease under investigation with other virus diseases of cereals in the U.S.S.R. showed it to have many properties in common with the pupation disease of oats [ibid., xviii, p. 666], from which it differs, however, in the absence of protein

crystals from the cells of mosaic plants, the different vector, and the longer incubation period.

Kostoff (D.). **Effect of the fungicide 'granosan' on atypical growth and chromosome doubling in plants.**—*Nature, Lond.*, cxliv, 3642, p. 334, 1939.

In experiments at the Moscow Institute of Genetics the writer found that the treatment of germinating grains of rye, wheat, *Triticum persicum*, *T. durum*, *T. polonicum*, and *T. aegilopoides* with 0·5 to 0·1 per cent. granosan [*R.A.M.*, xviii, pp. 115, 137] (containing 0·01 to 0·002 per cent. ethyl mercury chloride), for three to six (or up to 21) days resulted in swellings of the root tips and of the whole seedlings. A cytological study of the affected material revealed abnormal mitoses similar to those induced by colchicin and acenaphthene and involving failure of achromatic figures, chromosome multiplications, multinucleations, and formation of large amoeboid nuclei. Chromosome doubling and large nuclei were also characteristic of the root tips of similarly treated peas. Germinating seeds immersed in granosan for the induction of polyploidy are not attacked by fungi, which usually cause serious infection of those treated with colchicin.

Garrett (S. D.). **Utilization of nitrogen by Ophiobolus graminis.**—*Nature, Lond.*, cxlv, 3664, pp. 108–109, 1940.

In further experiments with *Ophiobolus graminis* [*R.A.M.*, xviii, p. 386] chaffed wheat straw (6 gm.) was bottled with 24 ml. of either water or calcium nitrate solution (corresponding to 0·25 gm. of nitrogen per 100 gm. air-dry straw), autoclaved for 30 minutes and inoculated with pure cultures of the fungus. The average loss in dry weight after incubation for three and six months at 25° C. was 21 and 23 per cent., respectively, in the water series, and 27 and 33 per cent., respectively, in the calcium nitrate series. In the latter the amounts of nitrate nitrogen present in the sterilized but not inoculated control, in the straw inoculated and incubated for three months, and in that inoculated and incubated for six months were 240, 13, and 0 mg. per 100 gm. air-dry straw, respectively, indicating (in support of Padwick's conclusions [ibid., xv, p. 490]) that pure cultures of *O. graminis* growing on sterilized wheat straw can utilize nitrate nitrogen.

Winter (A. G.). **Weitere Untersuchungen über den Einfluss der Bodenstruktur auf die Infektion des Weizens durch Ophiobolus graminis.** [Further investigations on the influence of the soil structure on the infection of Wheat by *Ophiobolus graminis*.]—*Zbl. Bakt.*, Abt. 2, ci, 18–20, pp. 364–388, 6 figs., 2 graphs, 1940.

Further studies at the Bonn Phytopathological Institute on the relation of soil structure to the infection of wheat by *Ophiobolus graminis* [*R.A.M.*, xix, p. 204] led to the following conclusions. The failure of attempts to demonstrate the inhibitory effect of soil consolidation on the infection of plants in pot experiments is attributed to the fact that primary invasion usually takes place at a point in the root system more or less remote from the stem base. Such being the case, the moment at which the 'runner' hyphae reach the stem base and begin

the disorganization of the central vascular tissue is a critical one in the course of the disease, and although the growth rate of the 'runners' and consequently their time of arrival at the stem base is greatly delayed by consolidated soil, the adverse effect on the fungus can only be judged by the maintenance of a certain distance between seed-grain and inoculum so as to avoid immediate infection of the stem base.

The retardation of infection in a compact soil does not at once become apparent; the superior development of the plants being noticeable only when the 'runners' have advanced to the stem bases in the loose soil and destroyed all the roots. The differences in the growth rate of the two series of plants beginning at this juncture persist until the 'runners' have also reached the stem bases in the compact soil. The time occupied by this differential mode of development, designated the protective period of soil consolidation, ranged from 12 to 36 days at distances of 0 to 15 cm. between the seed-grain and the inoculum. To cite some experimental figures, at 6 cm. the differences in development between the plants in the loose and compact soils began to be perceptible after a fortnight from sowing, increased up to the 25th day, and disappeared after the 31st, when those in both series were dead. At 9 cm. the protective period only commenced on the 19th day after sowing, reached a maximum after 37 days, when the average lengths of the plants in the compact and loose soils were 28·5 and 21·9 cm., respectively, and did not terminate until the 45th day. In the 12 cm. series on the 40th day after sowing (five days before the maximum effect was reached), 43 plants in compact soil weighed 20·6 gm. and the same number in loose 9·3, the loose-soil plants having 156 leaves (106 wilted) compared with 206 (19 wilted) for the corresponding compact-soil series. These results confirm the outcome of similar experiments by Fellows and Ficke in the United States [ibid., xiv, p. 433].

Considering the possibilities of practical control of *O. graminis* by the intelligent application of the principles of soil consolidation to the 'runner' theory, the writer points out that success depends primarily on the time of commencement of the protective period, and secondarily on its duration. It should begin sufficiently late and last long enough to cover the maturation of the plants in compact soil. The method is effective only against late attacks of the fungus, resulting in the milder forms of 'white heads', not against early invasion, in the case of which the protective period both begins and ends too early to ward off the parasite even in compact soil.

There are two points of special importance to be borne in mind in the assessment of the influence of environmental factors on the success of the soil consolidation method of foot rot control. A sharp line must be drawn between the number of infectious soil particles per unit volume and the actual risk of infection by *O. graminis*, which also depends on the period required for the 'runners' to reach the stem base. The greater the extent of soil infestation the shorter is the distance between the site of infection and the stem base, since the roots will sooner encounter the contaminated particles in their penetration of the soil. Taking these relationships into account, the influence on the beginning of the protective period and thus on the outcome of the treatment on the likelihood of infection, the consolidation quotient (defined as the

percentual decrease in the growth rate of the 'runner' following consolidation of a loose soil), and various external factors, such as the nature and degree of soil infestation and the growth rate of the 'runners', may be defined by the aid of simple mathematical formulae.

BOCKMANN (H.). **Fruchtfolge und Halmbruchkrankheit bei Getreide.** [Crop rotation and eyespot lodging of cereals.]—*Landw. Jb.*, lxxxix, 3, pp. 393–412, 4 diags., 1939.

This is an account of the writer's observations on the relation of crop rotation and other cultural practices to the incidence of *Cercosporella herpotrichoides* on cereals, especially winter wheat and barley, in Schleswig-Holstein [*R.A.M.*, xviii, p. 586]. In most cases the attack of *C. herpotrichoides* can be prevented by a single exclusion of wheat from the sequence, but under present conditions such a step is undesirable unless the consequent shortage of grain for milling can be made good by the interposition of a rye crop. Another possibility is to extend the area under wheat and thereby minimize the risks of loss through disease. Strict attention to crop rotation with non-Gramineae and to shallow, sparse, and late sowing should serve in the generality of cases to reduce the damage from *C. herpotrichoides* to a reasonable limit.

KINGSOLVER (C. H.) & MURPHY (H. C.). **Physiologic race determination in Puccinia coronata avenae.**—Abs. in *Phytopathology*, xxx, 1, pp. 13–14, 1940.

A study of the reaction of 21 varieties of oats to 21 single-pustule isolates of crown rust (*Puccinia coronata avenae*) collected in 16 States of the American Union was made at the Iowa Agricultural Experiment Station in 1938. The varieties comprised those used for physiologic race determination by Murphy in the United States [*R.A.M.*, xiv, p. 435; xvi, p. 245] and Straib in Germany [ibid., xvii, p. 233]. On the basis of Murphy's 13 varieties it was possible to identify 19 races, on that of Straib's 15 varieties 46, and with the whole assortment of 21, 54. Twenty-four isolates identified as Murphy's race 1 could be separated into 18 races by their reaction on Straib's varieties, while 28 of race 6 fell into 16 by the same criterion. Twelve isolates giving the same reaction on Straib's varieties were separable into two races (1 and 6, accommodating 3 and 9 isolates, respectively) by their reaction on Murphy's assortment. Of the 19 races identified by means of Murphy's varieties, six were new. Races 1 and 6, in practically equal ratios, accounted for over 50 per cent. of the total number. Race 47, originally differentiated by Waterhouse in Australia [ibid., xv, p. 635], was identified in two collections, this being its first appearance in the United States. Race 7, formerly one of the most prevalent, was only twice recognized.

ROSEN (H. R.), WEETMAN (L. M.) & MCCLELLAND (C. K.). **Hybridizing Oats to combine growth for winter pasture, hardiness, and resistance to rusts and smuts.**—*J. Amer. Soc. Agron.*, xxxii, 1, pp. 12–14, 1940.

Among the 28 promising oat hybrids in course of development at the Arkansas Agricultural Experiment Station for resistance to rusts [*Puccinia graminis* and *P. coronata*] and smuts [*Ustilago avenae* and

U. kolleri: *R.A.M.*, xix, p. 206] conjoined with hardiness and suitability for winter pasture [ibid., xix, p. 11] may be mentioned the following, now in the F_4 or F_5 generations: Coker's 32–1 × Victoria and its reciprocal, Tennessee 1884 × Bond, Tennessee 1922 × Bond, Fulghum 3232 × Bond, Lee × (Victoria × Richland) and its reciprocal, Custis × (Bond × Iogold) and its reciprocal, Hairy Culberson × Bond, Coker's Fulgrain 33–19 × (Victoria × Richland), Victoria × Custis, and Victoria × Coker's Fulgrain 33–19. While some of the hybrids obtained appear to be homozygous for resistance to rusts and smuts and for winter growth and hardiness, a relatively large number are still segregating. The chief emphasis has been placed on breeding for much needed winter forage but grain characters have also been considered.

Derick (R. A.) & Hamilton (D. G.). **Further studies on Oat blast.**—*Sci. Agric.*, xx, 3, pp. 157–165, 1939.

Further studies on 'blast' disease of oats in Canada [*R.A.M.*, xvi, p. 310] showed that the disease exercises a marked effect on yield, the actual loss being directly related to the amount of blast present. In five varieties showing 0 to 10 per cent. blast the average number of spikelets per panicle ranged from 27·69 to 45·12, and the average yield per panicle from 1·94 to 2·26 gm., the corresponding figures for plants with 10·1 to 20 per cent. blast being 27·19 to 44·62, and 1·52 to 1·82, while for plants with over 30·0 per cent. blast they were 23·98 to 37·59, and 0·81 to 1·17, respectively. The average decrease in yield per blasted spikelet for the same varieties ranged from 0·028 to 0·117 gm.

No statistical relation was found between the number of blasted spikelets and the total number of spikelets (fertile and infertile), except in the variety Eagle for which the correlation was negative and significant. Evidence indicated that the physiological conditions associated with the causes of blast may adversely affect the development of the remaining fertile spikelets. Varieties with similar amounts of blast may show differences in loss of yield, the varietal reaction depending on genetic factors.

Anerud (K.). **Mjöldryga och ergotism.** [Ergot and ergotism.]—*Landtmannen, Uppsala*, xxiii, 49, pp. 1185–1188, 3 figs., 1939.

The writer has assembled some interesting data on the history of ergot (*Claviceps purpurea*) and ergotism from earliest times to the present day. As in other countries, rye is the cereal crop chiefly affected in Sweden, though six-rowed barley is also liable to attack in the north, and in 1938 the spring wheat crop in northern Bothnia suffered too, the last case being very exceptional, while there is no authentic record of the fungus on oats in the country. The gradual decline in the severity of the disease is attributed to improved methods of cultivation, including the use of clean seed, deep ploughing, judicious crop rotation, and the selection of varieties with a short, regular flowering period to minimize the changes of infection during the critical time. The first credible report of an epidemic of ergotism [*R.A.M.*, xi, 445] is stated to date from 857 from the Lower Rhine. During the period from 1745 to 1867 there were ten outbreaks of the disease in Sweden, while both Finland and Russia [ibid., xix, p. 209] have fre-

quently experienced severe visitations; in the former country the mortality during the epidemic of 1862–3 was estimated at 2·7 to 22·7 per cent., and in the latter it has on occasion risen to 50 per cent. The Russian outbreak of 1926–7 [ibid., ix, p. 103] is calculated to have involved at least 2 per cent. of the population of 506,000 in the affected region. The exceptionally cold and wet weather during the summer of 1926 resulted in a poor harvest of rye and an abnormally high one of sclerotia of *C. purpurea* (4,000 tons in the area under observation). A proportion of 1 per cent. sclerotia among the rye flour is believed to have caused illness, while 7 per cent. led to acute poisoning.

Most of the ergot for medicinal use originates in Spain and Russia, but it is often difficult with modern methods of cultivation to procure sufficient quantities by natural means; this necessitates the artificial infection of the crop with the aid of conidial suspensions [ibid., xix, p. 95], giving a yield of up to 527 kg. sclerotia per hect. which represents a value of Kr. 5,000 at prevailing prices.

BÉKÉSY (N. v.). **Untersuchungen über den Alkaloidgehalt des Mutterkornes. II. Mitteilung: Über den Alkaloidgehalt des parasitisch kultivierten Mutterkornes.** [Studies on the alkaloid content of ergot. Note II: On the alkaloid content of parasitically cultivated ergot.]—*Biochem. Z.*, ciii, 5–6, pp. 368–382, 1 fig., 3 graphs, 1940.

In the writer's further studies on the factors affecting the intensive production of rye ergot [*Claviceps purpurea*] in Hungary [*R.A.M.*, xix, p. 94, and cf. preceding abstract], environmental factors were found to play only a very minor part in the alkaloid content of the sclerotia, the extent of which rests primarily on a hereditary basis. This is a matter of great importance, since all the properties of the selected sclerotia are transmissible in field cultivation by asexual propagation. The highest alkaloid content in large-scale trials was secured from sclerotia on the Fleischmann variety and amounted to 0·74 per cent., believed to represent the maximum yet recorded.

BURNHAM (C. R.) & CARTLEDGE (J. L.). **Linkage relations between smut resistance and semisterility in Maize.**—*J. Amer. Soc. Agron.*, xxxi, 11, pp. 924–933, 1 diag., 1939.

Crosses between chromosomal interchange lines of maize susceptible to smut [*Ustilago zeae*: *R.A.M.*, xviii, p. 670] and a resistant Lancaster Surecrop inbred line were back-crossed at the West Virginia Agricultural Experiment Station during 1936 to 1938 to a susceptible Leaming inbred to study segregation for smut reaction in relation to the interchange points. From data obtained in 1936 smut resistance in Lancaster was found to be at least partially dominant, and under the prevailing experimental conditions the back-cross to the susceptible parent provides the best material for a study of segregation for smut reaction.

The results showed that highly significant deviations from randomness were obtained in the direction expected with linkage between smut resistance and the following interchanges: 1–2c, 1–6a, 1–9b, 2–6a, 3–8a, and 6–8a. Less significant deviations but in the same direction were obtained for 2–3a, 2–4d, 3–5a, 3–7b, 3–10a, 4–9a, and 9–10a. Of these interchanges incomplete evidence indicates that the locus of

1–2c in chromosome 2 is one of the loci showing linkage with smut reaction. In all other cases the break locus in either, or the loci in both chromosomes involved in the interchanges listed above may be associated with resistance.

ARK (P. A.). **Bacterial stalk rot of Field Corn caused by Phytomonas lapsa, n.sp.**—Abs. in *Phytopathology*, xxx, 1, p. 1, 1940.

Phytomonas lapsa n.sp., the agent of a rapid decay of the leaf and stalk parenchyma of maize, resulting from the use of diseased seed or contamination through the soil, occurred in epidemic form in California in 1937 under favouring conditions of high temperature and extreme humidity, frequently causing the collapse of the plants. It was isolated from the external parts and alimentary canal of *Diabrotica* beetles. The pathogenic bacterium, 1·55 by 0·56 μ, is motile by 1 to 4 polar flagella, producing fluorescence in Uschinsky's, Fermi's, and Cohn's solutions, and evolving acid (but no gas) from dextrose, sucrose, maltose, lactose, glycerine, arabinose, xylose, galactose, raffinose, and mannitol. Dusting the seed with semesan bel gave satisfactory control of the disease. Of the many species of plants inoculated with *P. lapsa*, sugar-cane was the only one to contract infection.

MEZZETTI (A.). **Ricerche sull' eziologia della 'piticchia batterica' dei frutti di Limone.** [Researches on the etiology of 'bacterial pitting' of Lemon fruits.]—*Boll. Staz. Pat. veg. Roma*, N.S., xix, 2, pp. 189–221; 3, pp. 251–292, 4 pl., 11 figs., 1939.

A detailed account is given of a comprehensive series of experiments undertaken to determine the etiology of bacterial pitting of oranges and lemons in Sicily, the symptoms of which appear to be identical with those of black pit and (on the twigs) citrus blast (*Bacterium* [*Pseudomonas*] *syringae*) [*R.A.M.*, xviii, p. 672], but which also resemble those attributed by Rabinovitz-Sereni in Italy and Doidge in South Africa to *Bacillus* [*Bact.*] *citrimaculans* [ibid., xii, p. 283; xvi, p. 302].

Isolations from affected fruits in most cases gave practically pure colonies of the *P. syringae* type, though others gave yellow colonies, either pure or mixed with colonies of the *P. syringae* type. No evidence was obtained to support the view that the yellow colonies belonged to *Bact. citrimaculans*.

Inoculations of healthy, wounded lemons were made with 13 strains isolated from affected orange and lemon fruits (strains h, i, j, k, η, l, m, n, o, γ, ϵ, q, r), with 9 strains isolated from twigs of bitter orange and sweet orange (strains a, b, c, d, e, f, g, α, p), one from pear leaves accidentally infected during the author's experiments (strain s), a strain of *P. pyocyanea* [*Bact. pyocyaneum*: ibid., xvi, p. 297], and a fluorescent strain (θ) from broad bean infusion. The results demonstrated that all the fluorescent strains from citrus fruits and branches and from pear leaves were pathogenic, except p; the yellow strains, α, γ, η, strain o, the brown strain, j, *Bact. pyocyaneum*, and the bean strain were not pathogenic. Inoculation of unwounded lemons by sprinkling with suspensions of the two most virulent strains (d from a blast lesion and i from a black pit lesion) gave positive results.

Syringe and needle-prick inoculations of lilac shoots with one strain from blast (b), and strains i, j, l, m, n, o, p, q, r, from black pit showed all the strains to be pathogenic except j, o, and p. Similar inoculations of pear shoots with the same strains (except i) showed that strains b, m, q, and r were pathogenic, j, o non-pathogenic, and p, l, and n uncertain.

A study [which is fully described and the results of which are tabulated] of the morphology and biochemical properties of these strains showed that strains b, e, g, i, n, r, s, ϵ agreed with *P. syringae*, strain j fell into a group by itself, strains o, α, γ, η formed a third group, and strains p, *Bact. pyocaneum*, and θ fell into three further groups.

A bibliography of 73 titles is appended.

GODFREY (G. H.) & FRIEND (W. H.). **Diplodia stem-end rot of lemons controlled with sodium ethyl mercuri thiosalicylate.**—*Science*, N.S., xci, 2352, pp. 94–95, 1940.

The effective control of certain animal fungi by merthiolate [*R.A.M.*, xiv, p. 695] or sodium ethylmercurythiosalicylate suggested the application of the compound in the treatment of stem-end rot of lemons (*Diplodia*) [*natalensis*], and experiments in this direction in the autumn of 1939 at the Lower Rio Grande Valley Substation, Weslaco, Texas, gave very encouraging results. Used as a tincture at a strength of 1 to 1,000, the chemical reduced the incidence of infection from 84 to 0 per cent. in a three weeks' trial, while almost equally thorough elimination was secured with dilutions of 1 to 5,000. Sulfomerthiolate or sodium para-ethylmercurythiophenylsulphonate also proved very successful for the purpose in view. The treatments were applied by a 'stamp pad' method, in which a piece of heavy felt in a non-corrosive holder was kept moistened with the antiseptic solution. The individual fruits were pressed with their stem ends against the felt with a slight twisting motion (through about 60°), entailing the complete wetting of the button and adjacent rind. Total immersion for two minutes in 1 to 10,000 dilutions of both merthiolate and sulfomerthiolate gave 99 to 100 per cent. control in late-season tests, while the untreated fruits developed 27 to 35 per cent. decay in three weeks. While these chemicals are expensive, the cost of the treatment by the pad method is almost negligible in comparison with losses frequently encountered in untreated or improperly treated fruit.

BRIXHE (A.). **Le wilt du Cotonnier.** [Cotton wilt.]—*Bull. Com. coton. congol.*, iv, 15, pp. 79–82, 2 figs., 1939.

This is a summary of the writer's observations in the United States on American methods of combating the *Fusarium* wilt of cotton (*F. vasinfectum*), with a view to their application in the Belgian Congo, where the presence of the disease has recently been established [*R.A.M.*, xviii, p. 797].

ROBERTS (ELIZABETH O.). **Conidial germination of the Cotton root-rot fungus.**—*Bull. Torrey bot. Cl.*, lxvii, 1, pp. 77–78, 1940.

In germination tests with conidia of the cotton root-rot fungus,

Phymatotrichum omnivorum [*R.A.M.*, x, p. 186], conducted in Texas, maximum germination, which never exceeded 5 per cent., occurred in conidia stored for three days or more at 5° C. previous to the test and then (after treatment with mercuric chloride solution) incubated at 30° in darkness for three days on the following media: egg albumen, potato dextrose, and Weindling's agars, potato dextrose and manure decoction broth, and potato dextrose agar plus either yeast extract or manure. Germ-tubes frequently reached a length of 34 μ, their average duration being three days. The low percentage of germination obtained is attributed in part to the treatment with mercuric chloride. Spores stored at room temperature for several months and failing to germinate developed germ-tubes after subsequent storage at 5°, indicating that dormancy rather than non-viability may account for the failure of the spores to germinate. Other incubation conditions and media tested showed reduced or no germination. It is suggested that the failure of the germinated conidia to continue development may be explained by the assumption that the fungus is heterothallic and that cultures so far tried contain but one of the necessary plus and minus strains.

Baudet (E. A. R. F.). **Sur une dermatomycose du Chien produite par Microsporum (Achorion) gallinae.** [On a dermatomycosis of the Dog produced by *Microsporum* (*Achorion*) *gallinae*.]—*Ann. Parasit. hum. comp.*, xvii (*1939–40*), 5, pp. 443–446, 2 pl., [? 1940].

From a sore on the head of a laboratory dog isolated for two months previously in a disused fowl-house the author isolated a fungus the appearance of which agreed perfectly with *Achorion* (*Microsporon*) *gallinae* [*R.A.M.*, x, p. 243; xiv, p. 101]. In culture the fungus formed downy, snow-white, later pink to reddish colonies which after a fortnight showed cracks. On beer wort agar fertile, branched hyphae developed, bearing piriform aleuria with a truncated base. Multiseptate spindle-shaped spores were observed. Experimental inoculations gave positive results on three out of three guinea-pigs, but negative results on three dogs, while on two out of two fowls they produced a whiteness of the comb, from which a fungus giving pink to reddish cultures closely resembling those of *A. gallinae* was reisolated.

McCrea (Adelia). **Studies of dermatophytic fungi with reference to the susceptibility of Guinea Pigs.**—*Pap. Mich. Acad. Sci.*, xxiv (*1938*), pp. 57–61, 1939.

In the writer's experiments at the Parke, Davis and Company Laboratories, Detroit, Michigan, guinea-pigs weighing 200 to 300 gm. were found to be definitely susceptible to infection by dermatophytic fungi of the genera *Trichophyton*, *Epidermophyton*, *Achorion*, and *Microsporon*, the period of optimum infection persisting sufficiently long for most experimental purposes [cf. *R.A.M.*, xviii, p. 177]. The maximum skin reaction is obtained with an extract of the causal agent of the lesions, but extracts of other species, or even of different genera, produce definite responses which complicate diagnosis. Reactions in 'normal' animals are attributed either to previous infection or to the presence of a dormant organism.

REYER (W.). **Infektionsversuche mit Blastozystis.** [Inoculation experiments with *Blastocystis*.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxliv, 7–8, pp. 421–425, 1939.

Continuing his studies at the Hamburg Institute of Naval and Tropical Diseases on the specific identity of the different types of *Blastocystis* parasitizing man [*B. hominis*] and animals [*R.A.M.*, xviii, p 676; cf. also xix, p. 151], the writer inoculated dogs, rats, and white mice with strains of the fungus from rats and man. The organisms were found to lose both their infectivity and their characteristic morphological features very rapidly in culture. The human blastocysts were not transmissible to dogs and rats, nor those of rats to mice, except in one or two doubtful instances which do not invalidate the general conclusion that different species of the fungus are concerned in the infection of man and the various susceptible animals.

MOORE (M.) & MAPOTHER (P.). **Chromomycosis of the face: report of a case and a study of the causative organism, Phialophora verrucosa.**—*Arch. Derm. Syph., Chicago*, xli, 1, pp. 42–54, 4 figs., 1939.

The case of a 67-year-old man suffering for about ten years from facial chromomycosis due to *Phialophora verrucosa* [*R.A.M.*, xviii, p. 28] is presented in detail, and considered to be of unusual interest both as the first recorded instance of the face as a primary site of infection (following trauma from a burn), and from the fact that the disease was acquired in Missouri, the patient having never left the State.

The lesion grossly simulated blastomycosis or tuberculosis verrucosa cutis. The strain of *P. verrucosa* isolated was identical in its microscopic features with the forms previously described from Boston, Texas, and Uruguay, but differed from them to some extent macroscopically. On Czapek's agar (on which the most rapid growth was made) the colonies, blue-black to ochraceous-brown at the periphery and rat-grey in the button-shaped centre, attained a diameter of 4·3 cm. in 22 days. The glycerine agar cultures were highly distinctive, being definitely raised above the surface of the substratum and of an intense black colour, with dark grey aerial hyphae. On dextrose, maltose, and potato dextrose agar the colonies were of various shades of slate- to olivaceous-grey and on yeast-dextrose agar they were black with a dark grey centre. The Texas strain of *P. verrucosa* was characterized by extremely slow growth, its diameter in 20 days being only one-fifth that of the other cultures.

BRICEÑO-IRAGORRY (L.). **Sobre cromoblastomicosis.** [On chromoblastomycosis.]—*Rev. 'Clinica Louis Razetti'*, i, 2, pp. 108–128, 13 figs., 1939. [Abs. in *Trop. Dis. Bull.*, xxxvii, 2, pp. 106–107, 1940.]

Following a short introductory history of chromoblastomycosis since its original description some 25 years ago, the author gives an account of a case of the disease in a 46-year-old negro at Caracas, Venezuela, characterized by verrucose, ulcerating lesions on the legs. On Sabourand's medium a fungus slowly developed, the macroscopic and microscopic features of which, together with the results of animal inoculations, led to its identification as *Hormodendrum pedrosoi* [*R.A.M.*, xvii, p. 747].

The author proposes the establishment of a new genus, *Carrionia*, to embrace organisms developing all three forms of fruit bodies (viz., *Hormodendron*, *Acrotheca*, and *Phialophora* types), typified in the present instance by *C. pedrosoi*.

YAMAMURA (T.). **Ein Sektionsbefund von Haut- und Eingeweideblastomykose.** [A report on the post-mortem in a case of cutaneous and intestinal blastomycosis.]—*Hihu-to-Hitunyo, Hukuoka*, vii, pp. 112–117, 1939. [Abs. in *Zbl. Bakt.*, Abt. 1 (*Ref.*), cxxxv, 23–24, p. 525, 1940.]

A yeast-like fungus isolated at a post-mortem examination from the skin, and lungs and other internal organs of a 65-year-old woman at Kumamoto, Japan, formed on a sugar-containing agar medium brownish, glistening, disk-shaped colonies. Septate mycelia were produced by budding, and chlamydospores and conidial chains were frequent, but no asci were observed. Glucose, galactose, saccharose, lactose, and inulin in peptone solutions were not fermented. Intraperitoneal inoculations into mice gave negative results. The organism is considered to be closely related to, but not absolutely identical with, *Coccidioides immitis* [*R.A.M.*, xix, p. 219].

LANGERON (M.) & GUERRA (P.). **Valeur et nature des variations et dissociations de colonies chez les champignons levuriformes.** [Value and nature of colony variations and dissociations in yeast-like fungi.]—*Ann. Parasit. hum. comp.*, xvii (*1939–40*), 5, pp. 447–469, 3 pl., [? 1940].

Observations made over a period of ten years on numerous strains of the 16 species of *Candida* previously studied [*R.A.M.*, xviii, p. 253] showed that in *Candida* the smooth, creamy type of colony alternates with the folded, membranous, rugose type, these types corresponding, respectively, with the S and R colonies of bacteria [ibid., xv, pp. 152, 502; xvii, p. 527; xviii, p. 526]. Mixed colonies may occur, as in the case of *C. albicans* and *C. tropicalis*, while some strains never change from the creamy type. The two phases are reversible, reversion being induced simply by a change in the reaction of the medium. The membranous R phase is characterized microscopically by (*a*) a pseudomycelium (formed by budding) which is strongly developed, often with coremia, and a reduction in the number of blastospores; (*b*) pleurogenous pseudoconidia, which in certain species, e.g., *C. tropicalis*, are able to form long, branching chains; and (*c*) non-septate filaments formed by pseudo-germination of the blastospores, pseudoconidia, and even portions of the pseudomycelium. The creamy S phase shows only free, yeast-like elements, with a few faint traces of pseudomycelium.

The S phase is the normal one. The R phase develops as a result of various factors, chiefly the reaction of the medium and 'elongation factors' (i.e., presence of carbon dioxide, nutrients with a high molecular weight, and nitrates). Some of these factors appear spontaneously in cultures three or four months old, and variation in such factors suffices to control and explain the alternation of the two phases and the slowness of the process. The R phase is always accompanied by the appearance of a veil in liquid media containing sugar. During the

passage from one phase to the other no important modifications occur in the zymogram or auxanograms of nitrogen and sugars.

It is concluded that there is no true dissociation in *Candida*, as the phases are always reversible. As there is no fundamental difference between the alleged dissociation of the yeasts and that of bacteria it becomes very doubtful whether there is any such thing as dissociation.

BURT (K. L.) & KETCHUM (HELEN M.). **The classification of strains of Monilia isolated from sputum.**—Abs. in *J. Bact.*, xxxix, 1, pp. 15–16, 1940.

Of 180 cultures of *Monilia* [*Candida*] isolated on glucose agar from the sputum of 174 out of 500 patients at the Michigan State Sanatorium, 146 were identified as *C. albicans* [*R.A.M.*, xix, p. 217], 32 as *M. candida* [*C. vulgaris*: ibid., xix, p. 18], and 2 as *C. krusei* [loc. cit.]. Fermentation tests were successfully conducted in modified Durham tubes containing Pfanstiehl maltose and sucrose. Twenty of the patients who were negative for tubercle bacilli by culture yielded *C. albicans* and one *C. vulgaris*.

GRIGORAKI (L.) & DAVID (R.). **Caractères bio-chimiques de Microsporum gypseum (Bodin, 1907). Caractères bio-chimiques de Microsporum fulvum (Uriburu, 1907).** [Biochemical characters of *Microsporum gypseum* (Bodin, 1907). Biochemical characters of *Microsporum fulvum* (Uriburu, 1907).]—*C.R. Soc. Biol., Paris*, cxxxii, 25, pp. 448–452, 1939.

Achorion (*Microsporon*) *gypseum* [*R.A.M.*, xviii, p. 523; xix, p. 92] being liable to confusion with *M. fulvum* [ibid., xviii, p. 523 and next abstract] by reason of the morphological similarities of the two species, the biochemical characters of the fungi were studied with the object of facilitating their differentiation. Casease and trypsin both developed slowly and acted feebly in cultures of *A. gypseum*, there was little change of colour in carbohydrate solutions, and no appreciable production of indol. In the case of *M. fulvum*, casease was very active, peptonizing 10 c.c. milk in a month, and trypsin comparatively so, developing in 20 days and liquefying the gelatine (18 per cent.) in the cultures in a further ten. The colours [Klincksieck and Valette's standard] of saccharose, lactose, maltose, glucose, mannose, and galactose solutions ranged through purple-red 556 to purple-red 581, purple 531 to red 16, purple 531 to red 26, purple-red 586 to red-orange 86, red 16 to red-orange 61, and red 3D to red-orange 76, respectively, in a 30-day period. Tests for indol gave negative reactions.

KINGERY (L. B.), WILLIAMS (R. J.), & KIDD (H. A.). **Influence of age on ringworm infection of the scalp: an experimental study.**—*Arch. Derm. Syph., Chicago*, xl, 6, pp. 879–886, 2 figs., 1939.

On a carefully selected nutrient medium [the composition of which is indicated], *Microsporon audouini* and *M. fulvum* [see preceding abstract] made more abundant growth in the presence of extracts (2·5 to 15 mg.) of preadolescent (five and ten years) than of mature (over 25) hair. The actual weights after desiccation ranged from 0·0013 to 0·0026 and 0·0008 to 0·0024 gm. for *M. audouini* on five- and ten-year-old hair, respectively, the corresponding figures for *M. fulvum* being

0·0067 to 0·0087 and 0·0064 to 0·0085 gm., respectively, while the amount of growth made in all the flasks containing mature hair was too small for weighing; the same was true of the controls (no hair) in the case of *M. audouini*, while *M. fulvum* was able to develop to the extent of 0·005 gm.

The infrequency of ringworm in adults is a matter of common observation. The results of these experiments may be interpreted either by the presence in young hair of nutritional substances or by that in older material of inhibitive or toxic elements.

Straib (W.). **Zum epidemischen Auftreten des Leinrostes in Ostpreußen.** [On the epidemic occurrence of Flax rust in East Prussia.]—*NachrBl. dtsch. PflSchDienst*, xix, 6, pp. 49–51, 1939. [Abs. in *Zbl. Bakt.*, Abt. 2, ci, 21–22, p. 423, 1940.]

Prior to 1937 *Melampsora lini* was of rare occurrence on flax in Germany, but in 1938 an exceptionally severe outbreak was reported from East Prussia. The author has established the existence of eight physiologic races of the rust [*R.A.M.*, xviii, p. 679]. Having regard to the risk of transmission of infection by means of the seed and stem fragments, the exclusive use of home-grown seed is recommended to avoid the introduction of new and aggressive races. The possibilities of checking the spread of the disease by seed treatment should also be explored. In localities threatened by rust epidemics it is advisable to sow the flax crop early enough for the harvest to precede the development of conditions favouring the growth of the pathogen.

Röder (K.). **Über einen neuen Hanfschädiger, Didymella arcuata n.sp. und seine Nebenfruchtformen.** [On a new Hemp pathogen, *Didymella arcuata* n.sp., and its imperfect stages.]—*Phytopath. Z.*, xii, 4, pp. 321–333, 7 figs., 1 graph, 1939.

Hemp in the vicinity of Berlin was observed to be attacked by a fungus causing a brown to whitish spotting of the leaves, with individual lesions up to 1·5 cm. in diameter, accompanied by severe stunting, diseased plants being 20 to 30 cm. shorter than healthy ones at the period of maximum infection (mid-June). From the necrotic foliar tissues the writer isolated in pure culture on standard media both the perithecia of an Ascomycete, *Didymella arcuata* n.sp. [with a Latin diagnosis], and the pycnidia of *Ascochyta cannabina*, together with a few chlamydospores. The brownish-black, globose to slightly depressed perithecia measure 100 to 150 (mean 130) μ in diameter; the elongated to subclavate asci, 57 to 60 by 10 to 13 (58 by 12, range 50 to 80 by 9 to 14) μ, are interspersed with non- to few-septate paraphyses, 23 to 60 by 0·5 to 1·5 (35 by 0·9) μ, and contain eight uniseptate, hyaline, mostly biseriate ascospores, 18 to 19 by 4·5 to 5·2 (18·6 by 5; range 16 to 22 by 4 to 6) μ; the dark brown, circular, rarely elongated to reniform pycnidia measure 100 to 150 (135) μ, occasionally up to 200 by 120 μ and contain mostly uniseptate, hyaline, elongated to oval, straight or slightly curved spores, 17 to 20 by 5·3 to 6·3 (18·5 by 5·8; range 13 to 25 by 3·5 to 8) μ, and a few biseptate, 22 to 28 by 5 to 8 (25 by 6·7) μ, borne on continuous, papilliform or columnar sporophores, 5 to 13 by 2 to 7 (9 by 4) μ; the intercalary, brown, smooth, circular

to oval, thick-walled chlamydospores measure 10 to 12 μ singly or 8 to 9 by 8 μ in short chains.

The examination of herbarium material of *A. cannabis* Lasch and *A. cannabis* (Speg.) Vogl., originally isolated from hemp in Germany and Italy, respectively, showed the former to be a valid species for which the name *Septoria cannabis* (Lasch) Sacc. [*R.A.M.*, xvi, p. 749] is not accepted. On the other hand, *A. cannabis* (Speg.) Vogl. revealed close affinities with *Phyllosticta cannabis* (Kirchner?) Speg. [ibid., xvii, pp. 180, 587] to which it is accordingly referred.

The optimum temperature for spore germination and growth in *D. arcuata* on potato juice agar was found to lie between 19° and 26° C., the minimum and maximum being 6° and 31°, respectively (after six hours). Daylight promoted reproductive and darkness vegetative development. The mycelium was white at first, changing to olive—later very dark green or sepia, with tints of varying shades of red and after several days of purple or isabelline, and a narrow, white strip at the edge of the growth zone.

Black (L. M.). **Mechanical transmission of Aster-yellows virus to leaf hoppers.**—Abs. in *Phytopathology*, xxx, 1, pp. 2–3, 1939.

The aster [*Callistephus chinensis*] yellows virus [*R.A.M.*, xix, p. 22] was mechanically transferred from viruliferous to non-viruliferous aster leafhoppers (*Macrosteles divisus*) at 0° C. Dilutions of juices from macerated viruliferous leafhoppers as high as 1 in 100 in 0·85 per cent. sodium chloride solutions were found to be infectious on injection into non-viruliferous insects through capillary glass tubes, up to 40 per cent. of the inoculated leafhoppers becoming infective for plants after incubation periods of two to six weeks. Mechanically inoculated insects are apparently quite as capable of transmitting the yellows virus to healthy asters as those that acquire the infective principle from feeding on diseased plants. When non-viruliferous leafhoppers, after feeding for two days on infected asters, were maintained on rye (immune from yellows), no virus could be detected in such insects at first but later juice from them, injected into non-viruliferous individuals, proved infectious at dilutions up to 1 in 100. This is considered to establish the multiplication of the virus in its insect vector.

Dunegan (J. C.). **A blight of wild Cherry seedlings.**—*Phytopathology*, xxx, 1, pp. 89–90, 1 fig., 1940.

Each spring since 1924 *Sclerotinia seaveri* has been observed causing a blight of wild cherry (*Prunus serotina*) seedlings in Georgia and Arkansas, commencing about the time of unfolding of the second pair of true leaves. The development of a brown, water-soaked area near the stem apex is accompanied by a loss of turgor, the infected seedlings being readily distinguishable by a characteristic drooping of the affected portion. The pathogen spreads down the stem, killing the plants on its arrival at soil level.

Crawford (R. F.). **The causes and control of chlorosis in New Mexico.**—*Bull. N. Mex. agric. Exp. Sta.* 264, 12 pp., 3 figs., 1939. [Abs. in *Exp. Sta. Rec.*, lxxxii, 2, p. 202, 1940.]

Foremost among the causes of chlorosis of ornamentals and fruit and

forest trees in New Mexico are stated to be fungal and virus diseases, stomatal obstruction by dust, subnormal early spring temperatures after coming into leaf, lack or non-availability of essential mineral nutrients, excess water, oxygen and nitrogen deficiency in the soil, and insufficient light. The form of the trouble due to mineral deficiency or non-availability, believed to be the most important of the factors listed, may be temporarily combated by the application to the soil, by sprays or injections, of iron salts [cf. *R.A.M.*, xv, pp. 229, 758, *et passim*], while the most effective permanent treatment consisted in the incorporation of farmyard manure with the addition of iron and aluminium sulphates (1 : 1) at the rate of 1 lb. of the mixture for each inch of diameter of the plant; an acid solution of these sulphates gave good control of chlorosis in American vines and other plants.

SCHULTZ (H.). **Untersuchungen über die Rolle von Pythium-Arten als Erreger der Fusskrankheit der Lupine. I.** [Investigations on the role of *Pythium* species as agents of Lupin foot rot. I.]—*Phytopath. Z.*, xii, 4, pp. 405–420, 5 figs., 2 graphs, 1939.

Previous studies having shown the prevalence of *Pythium* spp. in most of the soils in Germany where lupins suffer from foot rot, further investigations were made in 1938 at the Biological Institute, Dahlem, Berlin, to determine the part played by these organisms in the causation of the disease.

Out of 63 plants examined, 37 yielded *Pythium* (33 *Lupinus angustifolius* and two each of *L. luteus* and *L. albus*), other fungi encountered including *Rhizoctonia*, *Fusarium*, and *Botrytis*. For comparative purposes 41 other strains of *Pythium* from lupins, seven from hemp, apple, cucumber, lucerne, and tomato, and herbarium material of eight species from Baarn were available. On the basis of morphological and physiological characters, 37 of the strains fall into group A (*Pythium de Baryanum*) [*R.A.M.*, vi, p. 731; xviii, p. 832], characterized by a smooth or curved mycelium; globular or oval, terminal or intercalary, rarely lateral sporangia, 9·6 to 28·5 (mean 15 to 21·9) μ; similar oogonia; smooth, globular oospores, 12 to 25·5 (17 to 21·2) μ; by most profuse fructifications on Congo red agar and sterility on malt-peptone; by no growth on 0·01 per cent. malachite green; and by minimum, optimum, and maximum temperature requirements of 5° to 6°, 25° to 30°, and 35° C. Group B (*P. intermedium*) [ibid., xvi, p. 813] was represented by two strains (115 and 165), characterized by concatenate, globular, terminal, or intercalary sporangia, 14·3 to 21 (17) μ in 115, 9·9 to 17·6 (14·4) μ in 165. Sporangial production on Congo red and malt-peptone agars was sparse and very sparse, respectively; no oogonia or oospores were formed; good growth and dehydrase activity took place on 0·01 per cent. malachite green and the minimum, optimum, and maximum growth temperatures were 3° to 6°, 25°, and 32° to 33°, respectively. Two strains (35 and 155) temporarily referred to *P. vexans* (group C), though relationships with *P. allantocladon*, *P. ascophallon*, and *P. diameson* [ibid., xi, p. 546] are also indicated, are characterized by globular, oval, or irregular, terminal, intercalary, or lateral sporangia, 14·8 to 22 (18·75) μ in 35, 14·7 to 20·8 (17·23) μ in 155; oogonia and oospores smooth and globular, the latter filling the former completely or nearly

so and measuring (35) 12·7 to 18·8 (15·6) μ and (155) 13·8 to 17·6 (15·44) μ; sparse sporangial production on Congo red, none on malt-peptone; good growth and dehydrase activity on 0·01 per cent. malachite green; minimum, optimum, and maximum temperatures for 35, 5° to 6°, 25°, and 32° to 33°, and for 155, 5°, 25° to 30°, and 35°, respectively. Finally, one strain (178) is referred to *P. diameson* (group D), with globular or oval, terminal, rarely intercalary sporangia, 10·2 to 17·2 (14·5) μ; smooth, globular oospores entirely filling the oogonia of similar shape and consistency, 12 to 16 (13·68) μ; isolated sporangia and oospores on Congo red, sporangia only on malt-peptone; no growth on 0·01 per cent. malachite green; minimum, optimum, and maximum temperatures 6°, 20° to 25°, and 35°, respectively. The 37 strains of group A were isolated from *L. angustifolius* (27), *L. angustifolius* 'sweet lupin' S.E.G. (6), *L. luteus* (2), and hemp (2). *P. intermedium* (B) originated in *L. angustifolius* and an apple seedling, *P. vexans* (C) in *L. albus* and lucerne, and *P. diameson* (D) in 'sweet lupin'.

Department of Scientific and Industrial Research. Report of the Food Investigation Board for the year 1938.—277 pp., 2 pl., 2 figs., 5 diags., 88 graphs, 1939. [Issued January, 1940.]

This report [*R.A.M.*, xvii, p. 794] contains the following items of phytopathological interest. In experiments by F. Kidd and C. West (pp. 143–148) Cox's Orange Pippin apples from trees receiving no potash fertilizer developed fungal wastage [unspecified] sooner and more intensively (average percentage, 41·2) when stored at the optimum temperature 39° F. than those from trees supplied with potash (19·7). On the other hand, the presence of potash rendered the fruit more liable to low-temperature breakdown at 34°, though this result is of academic interest only since commercial storage of this variety is carried out at 38° to 39°.

In further experiments by A. S. Horne and R. G. Tomkins (pp. 171–173) on the relation between resistance, mortality, and spore load in Bramley's Seedling apples from three different localities, 50 per cent. wastage was observed after 80, 100, and 126 days in samples from Kent, the West of England, and the Fen district, respectively, to which spores of *Phomopsis malorum* had been added, and after 95, 118, and 122 days in the untreated samples. Wastage in samples to which *P. malorum* had been added was greater, but not significantly so, than in untreated samples from the same district. Susceptibility to attack by *Cytosporina ludibunda* was greatest in apples (Bramley's Seedling) from the Fens, followed in order by those from the west of England and Kent.

In trials by A. S. Horne and W. A. Roach (pp. 177–183) on the resistance of apple fruits to *C. ludibunda* in relation to the injection of the trees with solutions of fertilizers, inoculated Bramley's Seedling apples from trees injected with solutions containing nitrogen showed an increased susceptibility, particularly those injected in their 'off' year. On the other hand, injection of Boscombe's Mystery apple trees with solutions containing nitrogen induced resistance in the fruit, ammonium nitrate producing the most striking effect, followed by urea and asparagin. Fruit from Bramley's Seedling trees injected with

glucose showed a relative high resistance during early storage, but this was not maintained later.

In further experiments by A. S. HORNE and J. COLHOUN (pp. 173–177) on the resistance of apples (Bramley's Seedling) to fungal invasion in relation to locality, the average penetration of *Penicillium* through the lenticels was 97·6 per cent. for the fruit from Kent and 82·1 for that from Ulster, the corresponding percentages for *Botrytis* being 69·0 and 36·9, respectively. Following inoculation of the lenticels the *P.* spots developed more quickly on both Kent and Ulster fruit than in the previous year, whereas with *B.* the spots developed later in the Kent fruit and earlier in that from Ulster. Inoculation made through punctures resulted in the development of *P.* spots in every case within 3 to 10 days; *B.* spots developed in all the fruit from Kent within 3 to 24 days, but in the case of the Ulster samples only in 87·3 per cent. of punctures did spots develop within 4 to 41 days. The averages of radial advance for November and February were 1·091 and 2·499 mm. per day, respectively, for Kent, and 0·285 and 2·075 mm. respectively, for Ulster. The averages for natural spotting in January and February were 4·4 and 27·2, respectively, for Ulster, and 27·8 and 31·0, respectively, for Kent.

F. KIDD and C. WEST (pp. 157–160) found that the storage life of Doyenne du Comice pears in gas storage is shorter than that of other varieties owing to the development of brown heart, which occurred after 97 and 150 days at temperatures of 34° and 31·5°, respectively. The incidence of brown heart is apparently related to the degree of maturity of the fruit when placed in gas storage.

The results obtained by W. H. SMITH (pp. 148–153) with storage of Monarch plums have already been noticed from another source [ibid., xix, p. 105].

The same worker's (pp. 161–165) investigations on the gas storage of Monarch plums showed that at all temperatures tested (31°, 37°, and 45°) the incidence of physiological breakdown was lower in samples stored in gas mixtures 5 (composed of 5 per cent. oxygen, 2·5 per cent. carbon dioxide, and 92·5 per cent. nitrogen) and 6 (5 per cent. oxygen and 95 per cent. nitrogen, though 0·1 to 0·2 per cent. carbon dioxide accumulated owing to respiratory activity of the fruit), than in the control samples stored in air, the reduction being greatest in mixture 5; in mixtures 4 and 3 (the first composed of 16, 5, and 79, and the second of 18·5, 2·5, and 79 per cent. of oxygen, carbon dioxide, and nitrogen, respectively), there was an increase in physiological breakdown at 31° and 37°, but a slight reduction at 45°. It thus appears that a decrease in physiological breakdown occurs when, in the presence of small percentages of carbon dioxide, the concentration of oxygen is reduced to 5 per cent. There was generally some decrease in the amount of fungal rotting [unspecified] in the samples stored in the gas mixtures as compared with those stored in air.

The following results were obtained by C. R. FURLONG and J. BARKER (pp. 169–171) in small scale storage trials with Palestine grapefruit upon its arrival in England. At 65° slight brown pitting developed at the beginning of the storage period on a small proportion of the early-, middle-, and late-season fruit, but did not increase with prolonged

storage; after about 40 days all the fruit was wilted and unsuitable for commercial purposes. At 45° slight brown pitting developed on a few fruits of some of the early, middle, and late samples, but did not increase, while in other samples some fruits developed a spotting described as low temperature injury, which increased with prolonged storage. At 34° all the samples developed a form of low temperature injury, beginning with superficial browning of the skin between the oil cells, followed by the collapse of the latter and the development of numerous chocolate-brown spots, which enlarged slowly but did not coalesce. Generally the late-season fruit was more resistant to injury than the middle- and early-season, the last-named being the least resistant of all.

R. G. Tomkins (pp. 184–186) in continuation of his experiments on wastage in Jaffa oranges [cf. ibid., xix, p. 88] caused by *P. digitatum*, showed that storage in a saturated atmosphere under restricted ventilation, allowing for an accumulation of carbon dioxide up to 10 per cent., did not increase wastage, as compared with storage in a saturated atmosphere free from carbon dioxide. Wastage was greater in the early-season (November) fruit than in the later-season (March and May) samples. In trials with storage temperatures of 18°, 10°, and 5° C., the times taken for 10 per cent. wastage were 16, 45, and 55 days, respectively, for untreated fruit stored in March, and 12, 27, and 61 days, respectively, for that stored in May, the corresponding figures for fruit sprayed with spores of *P. digitatum* being 10, 30, and 43, and 7, 20, and 56 days, respectively; these data indicate that fruit stored in May was more susceptible than that stored in March. Greater wastage occurred in the fruit sprayed with spores than in untreated fruit. The increase in wastage due to the addition of spores was not the same at different temperatures, possibly owing to the effect of temperature on susceptibility to infection. The reduction of the storage temperature from 18° to 10° delayed the onset of rotting and decreased its rate of progress, while the reduction from 10° to 5° delayed the onset but did not influence the subsequent rate of decay. Storage at 5° for long periods caused some injury which increased susceptibility to rotting.

In experiments by the same author (pp. 186–189) on the use of treated wraps to prevent fungal rotting, the amount of wastage developing in storage at 18°, 10°, or 5° in oranges wrapped in wraps impregnated with o-phenylphenol (0·1 gm.) [cf. ibid., xix, p. 211] and either benzidine or hexamine (0·1 gm.) was considerably reduced (e.g., to 14 and 45 per cent. at 18°) as compared with those in untreated wraps (64 and 70 per cent. at 18°). Wraps treated with either of these two combinations are practically odourless. The relative amounts of o-phenylphenol and hexamine can be varied within wide limits, the most suitable proportion being about 35 parts of hexamine to 170 parts of o-phenylphenol. The total amounts of substances used can also be varied within wide limits without altering their retarding effect on rotting. Wraps treated with o-phenylphenol and hexamine were found to cause some injury to apples and bananas, but not to tomatoes and grapes.

J. C. Fidler and R. G. Tomkins (pp. 189–190) found that the addition of spreaders did not increase the effectiveness of borax in reducing green mould [*P. digitatum*: ibid., xviii, p. 246] in citrus fruits. Solutions of 1 per cent. borax plus 1 per cent. sodium hydroxide were as effective

as 5 per cent. borax. Dipping oranges in 2 per cent. sodium hydroxide reduced green mould as effectively as immersion in 5 per cent. borax and caused less injury to the skin.

Report of the Low Temperature Research Laboratory, Capetown, 1937–1938.—275 pp., 43 figs., 5 diags., 56 graphs, 1939.

This report [*R.A.M.*, xviii, p. 804] includes results of the following investigations. R. Davies, W. W. Boyes, and D. J. R. De Villiers (pp. 13–28) state that traces of internal breakdown occurred in 36 per cent. of one consignment of very ripe Santa Rosa plums [loc. cit.] stored for 25 days at 45° or 48° F. and then removed for ripening at 45°, a storage temperature of 48° being apparently safer for the most mature fruit. Kelsey plums stored at 34°, 45°, or 48° for 24 to 25 days and then ripened at 48° developed internal breakdown at all these storage temperatures, the defect being most severe at 34° and least so at 48°. This severe incidence of internal breakdown at all storage temperatures is stated to indicate a seasonal effect. Severe pitting and abnormal softening of the surface tissues (of unknown origin) occurred in Kelsey plums stored at 45° and 48° and is considered to be a major factor in their storage. Wickson plums stored at 45° and 48° developed severe breakdown which showed a tendency to decrease with increased maturity.

The same authors (pp. 51–53) found that Peregrine peaches of commercial maturity stored for 25 days at 34° and subsequently ripened at 45° required 2·5 to 3 days pre-storage delay at 75° to eliminate all but slight traces of woolliness [loc. cit.], or 4 to 5 days at 65° to eliminate it completely, while only moderate control was obtained with 10 days' delay at 50°. Slow cooling was less satisfactory than immediate cooling after a delay of 1 to 1·5 days and taking the quality of the fruit into consideration a delay temperature of 65° is considered to have been the most suitable. Ripening the fruit at 45° resulted in the absence of 'pink flesh' [loc. cit.]. Delayed storage produced an appreciable but less striking improvement in Elberta peaches, delay at 50° being apparently most suitable for this variety.

The results of J. M. Rattray's (pp. 55–65) experiments on the storage of Honeydew melons [cf. ibid., xvii, p. 723] showed that temperatures of 45° and 50° were more favourable for the development of fungal wastage [unidentified] than those of 60°, 65°, or 70° (the storage period in all cases being 25 days followed by 20 days at 50°), the most characteristic symptoms being slow-growing, brown, depressed spots, and stem-end rots, which do not seriously affect the edibility of the fruit. At the three higher temperatures, however, species of *Rhizopus* and *Penicillium* may occur and cause the complete collapse of a large number of melons in a short time.

J. M. Rattray (pp. 65–74) presents evidence that wastage in Gros Colman grapes including that caused by *Botrytis cinerea* and *Penicillium* [ibid., xviii, p. 804; xix, p. 24], considered as total wastage or separately for the two fungi again showed a tendency to increase with maturity of fruit. Desiccation of the stem and drop-berry [ibid., xviii, p. 805] were more severe in White Hanepoot grapes stored at 29° than in those kept

at 31° or 34°, but wastage caused by *B. cinerea* was reduced to 1·5 per cent. as compared with 4·5 and 5 per cent., respectively, at the two higher temperatures (the percentage of *Penicillium* wastage was inconsiderable at all three temperatures). Rapid pre-cooling before storage at 29° resulted in severe desiccation and an increase in the amount of drop-berry, but showed only 1·7 per cent. *Botrytis* wastage as compared with 8 per cent. in grapes directly stored at 34°.

J. E. van der Plank and J. M. Rattray (pp. 74–76) used volatile diethyl chloramine and tertiary butyl hypochlorite as preservatives for grapes by placing plugs impregnated by solutions of these substances in mineral oil or non-volatile saturated esters into boxes with Gros Colman grapes (one plug to each wrapped packet) stored for 19 to 20 days at 34° and thereafter for a week at 50°. Subsequent examination showed that *Botrytis* waste was reduced from 30·7 per cent. in the untreated control to 1·4, 3·2, and 2·5 per cent. in packets treated a day before cooling with 0·4, 0·2, and 0·1 c.c. of tertiary butyl hypochlorite in oil, respectively, and to 7·4, 4·0, 4·4, and 6·5 per cent. in packets treated with 0·2 c.c. tertiary butyl hypochlorite and 0·8 c.c. triacetin, the former and 0·8 c.c. ethylene glycol diacetate, 0·35 c.c. diethyl chloramine and 0·65 c.c. triacetin, and 0·18 c.c. diethyl chloramine and 0·82 c.c. triacetin, respectively, and cooled immediately. When one large plug treated with 2·0 c.c. tertiary butyl hypochlorite and 8 c.c. oil was placed in the centre of each box directly before cooling the percentage of *Botrytis* waste was reduced to 8·8 from 29·8 per cent. in the untreated control.

J. E. van der Plank (pp. 76–78) discusses various methods of fumigating grapes against *Botrytis* rot and suggests the use of a mixture of finely powdered dehydrated potash alum and anhydrous sodium bisulphite which gives off sulphur dioxide (the only gaseous disinfectant permitted by the British Public Health Regulations) when exposed to the humid atmosphere inside a box of fruit. The output of sulphur dioxide can be controlled by regulating the intake of water vapour by enclosing the mixture in packets of varying permeability to water vapour, using smaller-sized packets and thus reducing the water-absorbing surface, or including within the packet a hygroscopic substance, such as an excess of dehydrated alum, capable of temporarily withholding water from the hydrolytic reaction. [Details of the packets and the quantities of the chemicals used are tabulated.]

In confirmation of previous conclusions regarding the drop-berry problem of grapes in storage [loc. cit.], E. Beyers (pp. 79–87) obtained further evidence that the incidence of drop and rate of desiccation of stalks of Waltham Cross grapes from Paarl were directly affected by the prevailing temperature during picking and packing and the degree of delay before cooling commences. Thus, picking under cooler conditions early in the morning ensured a better general keeping quality and gave rise to only 3·5 per cent. of drop-berries as compared with 5·8 in the afternoon pickings. Prompt cooling checked both drop and desiccation of stalks as well as the incidence of mould wastage (*B. cinerea*) and enhanced the freshness of the berries, while the opposite effects resulted from delayed storage and high temperatures during the marketing period. The results of irrigation experiments showed no material

improvement in drop, but less extensive desiccation of stalks for the irrigated plots. Grapes picked at an advanced stage of maturity showed a reduction in the amount of drop after storage, but were at the same time considerably more affected by wastage and more desiccated than at the green stages.

In storage tests with apples, W. E. ISAAC and W. W. BOYES (pp. 117–126) found that at storage temperatures of 31°, 34°, and 37° superficial scald was reduced or eliminated by oil wrappers in Rome Beauty apples without inducing any undesirable effects, and reduced but not eliminated in the Wemmershoek variety, for which oil wrappers were less effective at 31° than at 34° or 37°. Wemmershoek apples wrapped in oil wrappers showed in most cases a higher percentage of bitter pit, reaching a maximum of 29 per cent. as compared with 13 per cent. in those wrapped in sulphite wrappers. Immediately on removal from cold store superficial scald was absent or rarely exceeded 5 per cent. in Wemmershoek apples but increased with decreasing storage temperatures after one week at 65°. Rome Beauty apples showed two types of superficial scald, viz., the ordinary and the 'spotting' type. The latter occurred chiefly on apples stored at 37°, and was more abundant at 34° than at 31°. Immediately after withdrawal from store the percentage of scalded Rome Beauty apples could be directly correlated with storage temperature, but after a week at 65° the differences in the amount of scald (except for the 'spotting' type) in apples stored at the three temperatures had largely disappeared.

The results of storage experiments with Navel oranges conducted by J. E. VAN DER PLANK, J. M. RATTRAY, W. W. BOYES, and D. R. J. DE VILLIERS (pp. 126–142) showed that fruits from Cape Province stored at 40° and 50° exhibit a relatively low correlation between waste and temperature, while those from the Transvaal stored at 35°, 40°, 45°, 50°, and 55° were either little affected by temperature or adversely influenced by warmer temperatures. An examination of fruits from all temperatures showed that of a total of 4,166 infected, 3,840 (92 per cent.) were infected by green mould (*P. digitatum*) and only 78 by blue mould (*P. italicum*). The former usually enters the fruit at the stem end, possibly on account of the inherent weakness of this part of the orange, or because of the presence of clipper wounds in this region. An elimination of green mould infections of the stem end would, it is estimated, reduce the total waste in oranges to almost a third. *Alternaria* and *Colletotrichum* appeared to be the most common parasites in the group of stem end and lateral rots, which were encountered in a total of 181 fruits, or 4·3 per cent. of the total number of wasty fruits, there being an average for all consignments of 0·19 per cent. for fruit stored at 40° and 0·46 per cent. at 50°. Button browning [ibid., xviii, p. 805] occurred to a serious extent (69·1 per cent.) in a consignment from Groot Drakenstein and to a slight degree (1·4 per cent.) in one from Sundays River; the disease was greatly reduced or eliminated by storage at 50° instead of 40°.

J. E. VAN DER PLANK and J. M. RATTRAY (pp. 142–145) report that wraps impregnated with ortho-phenylphenol [see preceding abstract] reduced the *Penicillium* decay in stored oranges from 5 per cent. in the control to 1·5 and 2·9 per cent. in the fruit from Mataffin and from

3·2 to 0·8 per cent. in that from Rustenburg, but severe scalding of the rind occurred at all strengths used (2·4 to 4·5 gm. per 100 sq. ft. of paper).

J. E. VAN DER PLANK (pp. 145–155) tabulates evidence to show that Marsh grapefruit picked from the outside of the tree were consistently the most susceptible to cold injury in storage. In fruits stored at 40° for short periods (three to four weeks) delayed storage at 80° was generally beneficial and in those stored for long periods usually ineffectual, irrespective of the length of postponement, while in those stored for intermediate periods short delays of one to two days were most beneficial and long ones dangerous. In fruit stored at 40° or 45° without delay cold injury mostly developed during the first four to five weeks and thereafter increased very slowly, while retarded storage reduced this primary susceptibility but increased the subsequent development of injury.

Data on lemon storage [cf. ibid., xviii, pp. 437, 673] from three different growers presented by J. E. VAN DER PLANK, J. M. RATTRAY, P. A. CROUS, and J. KRIEL (pp. 156–169) are held to indicate that fruits stored for about four weeks at temperatures from 40° to 55° show least waste (mostly *P. digitatum*) when picked at a green stage, the average figures for all temperatures being 13·1 per cent. for the riper as against 1·7 per cent. for the greener stage immediately upon removal from storage, and 33·9 compared with 6·8 per cent. after a further fortnight at 65°. Green fruit appeared somewhat more susceptible to red blotch (adustiosis) [ibid., xvii, p. 390] and membranosis [ibid., xvii, p. 389] than the riper.

J. M. RATTRAY (pp. 170–176) tried a number of disinfectants for the control of green mould of oranges (*P. digitatum*), the inoculated fruit being held for 24 hours at 65° previous to dipping, and after the treatment air-dried, wrapped, and stored at 55°. Cold solutions of Wyandotte steri-chlor (containing 16 per cent. sodium para-toluenesulphonchloramide) gave poor results except for very long immersions, but by increasing the temperature of the solution the time of immersion can apparently be shortened and the concentration of the fungicide reduced. In preliminary experiments complete control was obtained with hot solutions (at 107° to 110°) of the fungicide in concentrations of 0·625, 1·25, and 2·5 per cent. There was little difference in the degree of control shown by cold (58°) and hot (104° to 106°) solutions of Shirlan WS plus agral I. With a time of immersion fixed at 4 minutes, sodium ortho-phenylphenate (dowicide A) at 0·5 and 0·17 per cent. proved more effective than the same concentrations of sodium para-phenylphenate or 1 and 0·33 per cent. Shirlan WS; 0·1 per cent. ortho-phenylphenol was far more effective than the same concentration of either trichlorophenol or dichloro-ortho-cresol; and 0·02, 0·04, and 0·08 per cent. sodium ortho-phenylphenate were conspicuously more effective than the same concentrations of sodium 2-4-5-trichlorophenate (dowicide B), sodium chloro-ortho-phenylphenate (dowicide C), or sodium tetrachlorophenate (dowicide F). Good control (0·0 to 3·7 per cent. of wounds infected) was obtained with concentrations of sodium ortho-phenylphenate of 0·20, 0·15, and 0·10 per cent., but 0·5 per cent. at 106° to 110° was injurious to the orange, causing brown blemishes.

Beare (J. A.). **Superficial scald in Granny Smith Apples.**—*J. Dep. Agric. S. Aust.*, xliii, 5, pp. 403–405, 1939.

In South Australia most growers rely upon sweating and late picking of apples for the control of superficial scald. In control experiments during 1939 with Granny Smith apples, wrapped and unwrapped fruit was subjected to various sweating periods and subsequently stored at 32° to 34° F. The mean percentage of scald in unwrapped fruit from all sweating treatments was 7·8 in the early-picked fruit (30th March) and 47·0 in the late-picked (17th April). Sweating for one or two weeks reduced the amount of scald in late-picked fruit from 82·3 per cent. in that stored immediately to 40·5 and 18·4 per cent., respectively, whereas the corresponding figures for the early-picked were 7·6, 11·4, and 4·4 per cent.; the method is considered to be an unreliable means of control. Late-picked fruit, whether stored immediately or sweated for one or two weeks, developed mealiness sooner and was in a poorer condition after storage than early-picked fruit, particularly when that had been stored immediately. Excellent results were obtained with oiled paper, either used as wraps or shredded and placed between the layers of unwrapped fruit, the percentage of scalded fruit under these conditions being 1·3 and 3·8, respectively, as compared with 82·3 in the unwrapped fruit and 61·4 in fruit wrapped in plain sulphite wraps. It is concluded from these results that scald-susceptible varieties can be supplied to the customer in good order, if they are picked in prime condition, stored immediately, and wrapped in oiled paper.

Kemp (H. K.). **Detection of water core in Apples.**—*J. Aust. Inst. agric. Sci.*, v, 4, pp. 227–229, 1 fig., 1939.

A method is described of separating apples affected with water-core [*R.A.M.*, xix, p. 29] from normal fruits without impairing their value for storage tests. A container was constructed with three holes in the top on which three apples were placed with the stem-end downwards; under each apple was a 100-watt electric light bulb. At one end was an inlet for a forced draught from a fan and at the other a light-proof draught exit. The central hole was used for the apple under test, and the end ones were occupied by an affected and a normal apple, respectively, used as standards of comparison, and the condition of which had previously been determined by cutting. The presence of water-core was revealed by a marked increase in the light transmitted by affected apples when observed in a dark room or under a hood. Severely affected fruits assumed a bright, luminous appearance with glowing spots where the water-soaked tissue reached the surface. With slightly affected apples detection was more difficult. The method failed when slight water-core was present in a lens-shaped area in the plane of the source of light, and gave uncertain results where patchy development was present throughout the flesh, 10 to 15 per cent. of apples separated as normal showing this slight, patchy form of water-core. X-rays [cf. ibid., xix, p. 225] and ultra-violet rays did not give satisfactory results. While admittedly imperfect, the method is considered useful for its purpose; only one size of fruit should be examined at one time.

Baines (R. C.). **Pathogenicity and hosts of the fly-speck fungus of Apple.**—Abs. in *Phytopathology*, xxx, 1, p. 2, 1940.

The fly-speck fungus, *Microthyriella rubi* [apparently the ascigerous stage of *Leptothyrium pomi*: *R.A.M.*, xii, p. 788; xvi, p. 278], has been collected in the perfect form in Indiana on sugar maple (*Acer saccharum*), white oak (*Quercus alba*), *Rubus allegheniensis*, *Sassafras variifolium*, willow (*Salix nigra*), *Smilax hispida*, *Staphylea trifolia*, *Gledits*[*ch*]*ia triacanthos*, *Rhus glabra*, and *Xanthoxylum americanum*, the mature ascocarps, asci, and ascospores from each host being morphologically similar. At Lafayette the ascospores reached maturity during the first half of June. Monospore cultures on potato dextrose, oatmeal, and other agar media were secured from the first seven of the plants listed above and gave rise to slowly-growing, grey, compact colonies at temperatures from 5° to 27° C., with an optimum at 15° to 24°, the P_H range on oatmeal agar extending from 1·8 to 8·2. Attempts to induce sporulation in culture were unsuccessful, but the inoculation of immature apple fruits with mycelium from the first five of the above-mentioned hosts resulted in the production of typical fructifications, accompanied by the usual symptoms of fly-speck.

Dey (P. K.) & Singh (U. B.). **The stem-black disease of Apple in Kumaun.**—*Indian J. agric. Sci.*, ix, 5, pp. 703–710, 2 pl., 1939.

The stem-black disease of apples caused by *Coniothecium chomatosporum* [*R.A.M.*, xv, p. 586] is stated to be present in every orchard in Kumaun [United Provinces]. A survey of the Government orchards at Chaubattia in 1936 showed that 60 per cent. of the apple trees were diseased but other fruit trees were not attacked. The fungus usually infects thick branches, entering through pruned surfaces and travelling downwards, forming a jet-black streak, which slowly surrounds the whole branch; in advanced stages cankers are formed and ultimately the branches are killed. The fungus has very short hyphae, dark brown conidiophores, and irregular, circiniform, muticate, non-catenulate, often coalescent and very variable conidia, 8·4 to 36·4 by 5·6 to 30·8 μ, or on the average 16·3 by 11·4 μ. Chlamydospores were formed in nature and both these and the conidia germinated readily in tap water within 24 hours, only about 5 per cent. of them growing directly into germ-tubes, while the rest released a large number of minute, hyaline secondary spores, measuring 2·8 to 7 by 2·8 to 6·3 μ. These in turn either formed germ-tubes or produced buds which germinated.

Artificial inoculations with single-spore isolations of the fungus were successful when drops of the spore suspension were placed on injured surfaces of the stem, but in no case did infection take place on uninjured surfaces. Inoculations of pruned surfaces with pure cultures of the fungus resulted in infection in seven to ten days, the organism being reisolated in every case. In culture the fungus grew on oatmeal, Brown's starch-synthetic, and Czapek's agars, but formed chlamydospores only. Growth was generally very slow; it was inhibited by a temperature of 86° F., but was resumed after the temperature was lowered. In Kumaun the pycnidial stage was not encountered and the fungus was observed to overwinter in the mycelial form. The primary conidia and possibly

the minute spores produced by budding from the secondary spores are believed to be the sources of infection, which usually appears in July and is at its height by the middle of August. Great numbers of both types of spores were caught in spore traps and found in rain drops, indicating that the infection is carried by wind and rain water.

In areas where the disease is established, careful pruning of the affected parts is recommended, while to prevent new infection the use of a dressing on cut surfaces is advised. Of a number of pastes tested, one consisting of 2 oz. red lead, 2 oz. copper carbonate, and 100 c.c. raw linseed oil proved most effective.

WALKLEY (A.) & KEMP (H. K.). **The occurrence of boron and manganese deficiencies in a sandy soil.**—*J. Aust. Inst. agric. Sci.*, v, 4, pp. 229–230, 1 fig., 1939.

During the past few years, plum trees growing at McLaren Flat, South Australia, in a sandy soil experimentally shown to produce symptoms of boron deficiency in various plants grown in pot cultures, have been affected by a condition resembling little leaf or rosette [*R.A.M.*, xviii, p. 261]. The growth at the tips of the main branches becomes chlorotic, and the leaves are dwarfed and misshapen; eventually, such growth becomes arrested, and in the following season severe die-back sets in, and continues to progress annually. Growth round the base of the tree becomes abnormally vigorous. Strong, apparently healthy, lateral growths develop, from which the main branches may be re-established in two or three seasons, but these branches in turn become affected. Manurial trials with various minor elements are in progress.

DUNEGAN (J. C.). **Unusual bacterial spot symptoms on Peach leaves.**—*Phytopathology*, xxx, 1, pp. 88–89, 1 fig., 1940.

A virulent outbreak of bacterial spot of peach (*Bacterium pruni*) in an 18-month-old Elberta orchard in Arkansas in June, 1939, was characterized by anomalous foliar symptoms consisting in the complete infiltration of large areas with the bacteria, imparting a greenish-yellow, translucent aspect under transmitted light and entailing the total disorganization of the cellular structure. The ground beneath the trees was strewn with leaves showing these atypical features, while others, detached from the twigs, adhered to the adjacent foliage by the mixture of gum and bacteria exuding from the diseased areas. Pure cultures of the pathogen were secured from the infiltrated tissues.

HILDEBRAND (E. M.) & PALMITER (D. H.). **Yellow-red or 'X' disease: a new threat to Peach industry.**—Abs. in *Phytopathology*, xxx, 1, p. 10, 1940.

Since its first detection in Connecticut in 1933, the yellow-red or 'X' disease of peaches [*R.A.M.*, xix, p. 228] has spread nearly across the United States, affecting all cultivated varieties but only the chokecherry (*Prunus virginiana*) among wild plants. From mid-June until the autumn the characteristic foliar symptoms of yellowing, irregular red spots, shot hole, and shedding are continuously present but seldom cause death in orchard trees, though those in the greenhouse succumb

after complete defoliation. Leaf fall is accompanied by fruit drop, but small mummies often remain attached. The sequence of symptoms in *P. virginiana*, namely, striking red and yellow foliage, succeeded by rosetting and ultimate death, is usually repeated year by year, though with considerable overlapping. During the first and second seasons from the inception of the disease the maximum counts of infection made in peach orchards were 62 and 96 per cent., respectively, the extent of involvement ranging from single shoots to entire trees. The symptoms may not appear for a year or more after inoculation by budding. The soundest control measure consists in the eradication of *P. virginiana*, on which the spread of infection is very rapid, from the vicinity of peach orchards.

HARRIS (R. V.). **Mosaic disease of the Raspberry in Great Britain. II. Experiments in transmission and symptom analysis.**—*J. Pomol.*, xvii, 4, pp. 318–343, 4 pl., 1 fig., 1940.

In continued studies on raspberry mosaic [*R.A.M.*, xiii, p. 248; cf. ibid., xix, p. 31], the author found that all attempts to transmit the disease by mechanical means gave negative results. Preliminary experiments carried out in 1926–7 showed that the disease can be transmitted to healthy plants of Baumforth's Seedling B by cleft grafting and during 1928–37 transmission was successfully achieved from ten varieties to healthy Baumforth's B and Lloyd George plants by this method and also by three variants of patch grafting, viz., the ring, the panel, and the inarching methods [which are described in detail]. An analysis of leaf symptoms in three raspberry varieties showed that they can be referred to two etiologically distinct groups, mosaic 1 and 2, the first typified by *b* symptoms [ibid., xiii, p. 248], on the indicator variety Baumforth's B; and the second by *c* symptoms on the same variety, *a* and ?*c* on Mitchell's Seedling, and by indeterminate symptoms on Norwich Market. Mosaic 1 behaves as a single disease, probably of single virus origin, uniformly mild in character and of comparatively restricted varietal distribution. Mosaic 2 includes two or more diseases differing in intensity from mild mosaic, with slight and evanescent type *c* symptoms and undetectable or very slow decline of the plant, to severe mosaic with intense and concentrated type *c* leaf symptoms and rapid decline and death of the plant. The possible relationship of mild and severe symptoms of mosaic 2 is discussed, but further data are necessary to draw final conclusions. Mosaic 2 was transmitted from ten varieties, which varied greatly in their susceptibility to this form of disease. Thus, Baumforth's B and Mitchell's Seedling are very susceptible and their stools are rapidly rendered unproductive and die, while Red Cross is totally infected but highly resistant, and on Lloyd George and some other varieties both mild and severe types of mosaic 2 may be masked or the symptoms very irregularly expressed. Combined infection with mosaics 1 and 2 was observed in the field and the severe mosaic on Lloyd George consists of such infection.

TIMS (E. C.). **Control of leaf blights of Fig.**—Abs. in *Phytopathology*, xxx, 1, p. 25, 1940.

In 1937 and 1938 practically complete control of the fig thread blight

caused by *Corticium stevensii* [*R.A.M.*, xiv, p. 795] was obtained with some copper sulphate-lime-arsenite eradicant sprays in Louisiana, where Bordeaux mixture has proved ineffectual for the purpose. For instance, several trees treated with a mixture containing copper sulphate, lime, zinc arsenite, monocalcium arsenite, and fish oil in 1938 remained healthy in 1939, denoting the extermination of the sclerotia of the parasite. In 1939 the trials were complicated by the development of another leaf-blighting fungus, *C. microsclerotia*, which caused widespread and severe premature defoliation and recurred to some extent following the harvest in July, though apparently amenable in the early stages to control by the above-mentioned mixture.

WALLACE (G. B.). **Cercospora leaf-spot of Banana (C. musae).**—*Mycol. Circ.* [*Tanganyika*] 5, 3 pp., 1939. [Mimeographed.]

Banana leaf spot (*Cercospora musae*), first recorded in East Africa by Hansford in Uganda in 1938, was found by H. P. Smart in June, 1939, on the Tanganyika coast between Dar-es-Salaam and Lindi, and in August near Pugu, on the Central Railway, the author also observing the disease in the latter month near Korogwe, Tanganyika Territory, at an elevation of nearly 1,000 ft.

WARDLAW (C. W.), BAKER (R. E. D.), & CROWDY (S. H.). **Latent infections in tropical fruits.**—*Trop. Agriculture, Trin.*, xvi, 12, pp. 275–276, 1939.

Much of the subject-matter of this paper has already been noticed from another source [*R.A.M.*, xviii, p. 193]. When a spore suspension of *Colletotrichum gloeosporioides* in water was applied to the surface of papaw fruits of any age at temperatures of 80° to 90° F. in a saturated or nearly saturated atmosphere the spores germinated rapidly and formed appressoria in about nine hours. Subsequent development did not appear to require such moist conditions, and penetration of the epidermis or sometimes entry through a stoma occurred after about 24 hours. The later behaviour of such infections was closely comparable with normal latent infections. The information gained from the study of latent infections has found practical application in the control of mango anthracnose (*C. gloeosporioides*) [ibid., xvii, p. 403] in Trinidad where it has been shown that in certain seasons five sprayings may definitely reduce the intensity of the disease developing in storage from latent infections.

SMITH (W. P. C.). **Brown spot, a serious disease of the Passion Vine.**—*J. Dep. Agric. W. Aust.*, xvi, 4, pp. 445–450, 4 figs., 1939.

During an inspection tour of some of the major areas of passion vine (*Passiflora edulis*) cultivation in Western Australia, the author observed a serious attack of brown spot disease of this crop, caused by *Alternaria passiflorae* [*R.A.M.*, xvii, p. 695]. A characteristic symptom of the disease was the development of dark brown lesions on the branches, which become girdled, resulting eventually in the death of all distal parts, the leaves usually remaining fresh and green much longer than the fruit, which may suddenly wilt. Brown spot is favoured by warm, moist weather and in normal seasons is most serious in the spring and

early summer. The following are the chief recommendations for control: training of vines on trellis wires; systematic pruning at least once a year, taking care to cut out all diseased lesions and to burn all prunings; spraying the vines after pruning with 4–4–40 Bordeaux mixture plus a spreader at monthly intervals during spring and early summer, and thereafter at intervals of two months if required by the season (ammoniacal copper carbonate may be substituted for the Bordeaux mixture in order to avoid discoloration of mature fruit); periodical examination of all vines and destruction of all new lesions found; and reduction to a minimum of all artificial watering, overhead watering being discouraged in home gardens.

Stationary spray plants. Success in Victoria.—*Fruit World, Melbourne*, xli, 1, p. 6, 1940.

Reports from fruit growers in Victoria state that the central stationary spray plants [*R.A.M.*, xv, p. 379; xvi, p. 547] installed continue to give satisfaction, the spraying costs being reduced by as much as half and applications being possible on land unfit to carry the ordinary outfit.

Müller (H.). **Prüfungsbericht über die Regelvorrichtung für das selbsttätige Zuteilen von Beizpulver beim Röberschen Trockenbeizer (Bauart Dr. Stümpfig) der Firma Gebr. Röber GmbH, Wutha i. Th.** [Report of tests on the regulating device for the automatic distribution of the disinfectant dust in the Röber dusting appliance (Dr. Stümpfig's construction) of the firm of Röber Bros. Ltd., Wutha (Thuringia).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), v, 1, pp. 5–6, 1 fig., 1940.

In collaboration with S. Reeh, A. Winkelmann, and K. Ebertz, the writer tested a device for the automatic regulation of distribution of the dust in the 'Saatfreund' seed-grain dusting apparatus, for use with the Petkus steel type 30 installation, and found it satisfactory for the purpose in view.

Brown (C. C.). **Contribution toward a host index to plant diseases in Oklahoma.**—*Circ. Okla. agric. Exp. Sta.* 33, 73 pp., 1939. [Mimeographed. Abs. in *Exp. Sta. Rec.*, lxxxii, 2, p. 200, 1940.]

This preliminary annotated check list, alphabetically arranged by the Latin names of the 284 cultivated and wild hosts, of 819 plant diseases in Oklahoma due to bacteria, fungi, phanerogams, viruses, and environmental conditions, is intended to serve as a framework for the further study of the occurrence, distribution, and importance of such disorders in the State.

Behr (L.). **Künstliche Immunisierung der Pflanzen.** [The artificial immunization of plants.]—*Umschau*, xliii, 48, pp. 1039–1040, 1939.

This is a concise critical survey, illustrated by concrete examples, of the present status of knowledge concerning the artificial immunization of plants against fungal and bacterial diseases.

HOFFMAN (C.), SCHWEITZER (T. R.), & DALBY (G.). **Fungistatic properties of the fatty acids and possible biochemical significance.**—*Food Res.*, iv, 6, pp. 539–545, 6 graphs, 1939.

At the Ward Baking Company, New York, the fungistatic properties of the normal saturated fatty acids containing 1 to 14 carbon atoms were studied over a hydrogen-ion range from P_H 2 to 8, and many of them were found to be remarkably effective in the inhibition of growth of some common moulds, such as *Aspergillus niger*, *A. glaucus*, *Rhizopus nigricans*, and *Penicillium frequentans* isolated from spoiled food products and cultured on raisins moistened with nutrient agar. Generally speaking, the branched chain acids were found to be more toxic to the fungi than the corresponding straight ones, the most powerful at a neutral reaction being those containing 8 to 12 carbon atoms. At P_H 2 and 3 formic acid was more active than acetic in the suppression of the moulds, whereas above 3 the latter was slightly stronger. Beta-iodopropionic acid probably exerts both a fungicidal and a fungistatic action, proprionic acid being mainly fungistatic.

PFANKUCH (E.). **Trübungsmessungen an Virusproteinen bei verschiedenen Aciditäten.** [Turbidity determinations on virus proteins at various acidities.]—*Biochem. Z.*, ciii, 5–6, pp. 342–348, 1 graph, 1940.

In further studies on plant virus proteins the writer determined the turbidity relations of the tobacco mosaic, tomato aucuba mosaic, and potato-X viruses [*R.A.M.*, xix, p. 48] over a wide range of hydrogen-ion concentrations (P_H 2 to 9). As in previous experiments, the curves of the tobacco and tomato aucuba mosaics were in substantial agreement, proceeding at an even rate from the alkaline side to P_H 4, at which point they rose sharply to reach a turbidity maximum at about 3·3, whereas the behaviour of potato virus X was again quite anomalous and no well-defined climax was attained. The specific viscosity of the tobacco mosaic virus showed a peak (223 gm. protein per c.c.) at P_H 4·24, with a secondary maximum on the acid side (3·03) of the isoelectric point. The minimum viscosity (50·2 gm. protein per c.c.) coincided with the maximum turbidity at the isoelectric point in consequence of maximal lateral aggregation of particles.

HERBERT (D.). **Plant viruses in Queensland I.**—*Pap. Dep. Biol. Univ. Qd*, i, 11, 4 pp., 1 pl., 1939.

In addition to curly top of the well-known weed *Galinsoga parviflora* attributed to a virus designated *Galinsoga* virus 1, two other viruses are recorded from Queensland, viz., lily mosaic (*Cucumis* virus 1) [*R.A.M.*, xix, p. 132], which developed in the autumn of 1939 in cucumbers and tomatoes in the north of the State, and *Dahlia* mosaic [cf. ibid., xvii, p. 443].

Tomato spotted wilt is prevalent on a wide range of hosts and during 1939 was responsible for heavy losses among Iceland poppies [*Papaver nudicaule*: ibid., xvii, p. 730].

How (J. E.). **The mycorrhizal relations of Larch. I. A study of Boletus elegans Schum. in pure culture.**—*Ann. Bot., Lond.*, N.S., iv, 13, pp. 135–150, 1 fig., 8 graphs, 1940.

The present cultural study of *Boletus elegans* [*R.A.M.*, xviii, p. 542] was undertaken in order to discover if possible the cause of the specialized relation of this fungus to larch. An examination of the mycelium showed it to be morphologically very similar to that of other species of *Boletus*. Growth in pure culture was found to be affected adversely by concentrations of the nutrient solution greater than about 0·2 M. The fungus utilized sugars, starch, and pectin, but not cellulose or lignin and as a source of nitrogen preferred inorganic ammonium salts, though it was capable of using nitrate, asparagin, peptone, and gelatine. The maximum range of hydrogen-ion concentration for growth on media containing glucose, salts, and inorganic nitrogen compounds was P_H 3·0 to 3·2 and 6·4. These results reveal no clue to the relationship of the fungus to the host and it is concluded that a pure culture study, while an essential preliminary, is not likely to lead to a solution of the problem of the behaviour of a soil fungus such as *B. elegans*; further studies should be directed to the fungus in relation to other members of the soil flora and the host plant.

Childs (J. F. L.). **Diurnal cycle of spore maturation in certain powdery mildews.**—*Phytopathology*, xxx, 1, pp. 65–73, 1 fig., 2 graphs, 1940.

A tabulated account is given of the writer's studies at the University of California on the cycle of morphological development of the conidiophores of *Erysiphe cichoracearum* from sunflower, cucumber, and *Aster* sp., *Podosphaera leucotricha* from apple, *Sphaerotheca pannosa* from rose, *E. polygoni* from bean (*Phaseolus vulgaris*), and *Oidium euonymi-japonici* from *Euonymus japonicus* [*R.A.M.*, xviii, p. 465], freshly infected leaves being collected at two-hourly intervals over 24-hour periods at Berkeley in July 1937 and June to July 1938.

The conidiophores examined exhibited the two types of conidial production differentiated by Blumer [ibid., xiii, p. 127], viz., the non-chain-forming, represented by *E. polygoni* and *O. euonymi-japonici*, and those forming chains of two to eight or more conidia, characteristic of the other mildews under observation. The diurnal cycle of conidiophore development in the two members of the former group was found to be similar to that reported by Yarwood for *E. polygoni* on clover [ibid., xv, p. 659], the period of conidial abstriction occurring between 10 a.m. and 2 p.m. in both instances. In the mildews of the chain-forming group the process of development is more complex, abstriction of the conidia taking place during the period from between 6 and 8 a.m. to between 2 and 4 p.m. and the formation of the succeeding crop from between 2 and 4 p.m. to between 6 and 8 a.m. in all cases. In *E. cichoracearum* from sunflower the peak of conidial abstriction was reached between 8 a.m. and 2 p.m., as shown by the periodical catching of dislodged spores for several days. The results of these spore maturation and liberation counts were in substantial agreement with those obtained by microscopic examination.

Stained conidiophores of the sunflower powdery mildew were shown

by microscopic inspection to contain two nuclei either in the basal cell or in that immediately above it, probably indicating that both cells are capable of functioning generatively.

Pryor (D. E.), Walker (J. C.), & Stahlmann (M. A.). **Toxicity of allyl isothiocyanate vapor to certain fungi.**—*Amer. J. Bot.*, xxvii, 1, pp. 30–38, 3 figs., 1940.

The toxicity of different concentrations of allyl isothiocyanate (mustard oil) vapour to spores and mycelium of *Colletotrichum circinans*, *Gibberella saubinetii*, *Aspergillus alliaceus*, and *A. niger* [cf. *R.A.M.*, xvii, p. 196] was tested by the method described in a previous paper [ibid., xviii, p. 753]. By partial pressure experiments it was found that the toxicity of the vapour in equilibrium with an aqueous solution depended on both the concentration and the amount of oil present in the solution. At high concentrations of vapour fungal growth in a closed system was inhibited provided sufficient oil was potentially available in the solution to maintain the inhibitory concentration of vapour; at lower concentrations growth was not inhibited even when the amount of potentially available oil in the solution was many times (three in the case of *G. saubinetii*) the quantity which would be inhibitory at a slightly higher concentration. These results are held to indicate that allyl isothiocyanate, unlike certain metallic ions, cannot act in a cumulative manner. The amount of oil needed to inhibit enlargement of colonies varied little for cultures 0 or 24 hours old, but it was higher when older thalli were used. In the series with 72-hour-old cultures *C. circinans* and *A. alliaceus* rapidly grew more resistant, while *G. saubinetii* and *A. niger* became only slightly more tolerant to the oil over the same period. Spores exhibited greater variability in tolerance to the oil than mycelium of any age tested. The amount of oil necessary to prevent the appearance of colonies from spores of *C. circinans* and *G. saubinetii* was less than the amount which stopped colony enlargement; with *A. alliaceus* the amount varied with the age of mycelium at the time of exposure; and with *A. niger* about the same or slightly more oil was required to prevent the appearance of the colony than to stop mycelial growth over the period tested. Colonies of *C. circinans* and *G. saubinetii* were generally killed at the point where growth ceased, while those of *A. alliaceus* and *A. niger* were merely inhibited and two to four times the inhibitory amount was required to kill them. The smaller the spore load the smaller was the amount of toxic material required to prevent germination.

Lucas (Hilde). **Weitere Untersuchungen über den Wuchsstoffhaushalt abbaukranker Kartoffeln.** [Further studies on the auxin economy of 'degenerate' potatoes.]—*Phytopath. Z.*, xii, 4, pp. 334–350, 1 fig., 1 diag., 2 graphs, 1939.

In continuation of Jahnel's studies on the relation of auxins to health and 'degeneracy' in potatoes [*R.A.M.*, xviii, p. 758], the writer investigated by the diffusion method at the Dresden Technical College the comparative values in this respect of sound and diseased material of the Parnassia, Odenwälder Blaue, Industrie, and Direktor Johanssen varieties.

In the early stages of growth there was little difference in auxin distribution between healthy and diseased plants, but in the course of development the latter were found to show a marked decline in auxin content, especially in the stem tips and leaves approaching maturity. For instance, the stem tips of 'degenerate' plants of the four varieties (in the order given above), contained 84, 76, 93, and 79 per cent. less than healthy ones, the corresponding values for the maturing foliage being 58, 47, 36, and 56 per cent., respectively. The young daughter tubers, too, only begin to show an auxin deficiency (23, 8, 13, and 44 per cent., respectively) in the later stages of development. Using methods based on the Went pea test (Jost, *Z. Bot.*, xxxiii, p. 193, 1938; Thimann and Schneider, *Amer. J. Bot.*, xxv, p. 627, 1938), the writer found that the petioles of diseased plants respond less actively than those of healthy ones to dilute concentrations of heteroauxin.

WENZL (H.). **Zur Frage nach dem Wesen der Braunmarkigkeit (Hohlherzigkeit) der Kartoffelknollen.** [A contribution to the question of the nature of medullary browning (hollow heart) of Potato tubers.] —*Phytopath. Z.*, xii, 4, pp. 351–359, 1939.

Evidence is summarized from the writer's observations and experiments in Austria, supported by a perusal of the relevant literature, to refute the hypotheses of Cristinzio [*R.A.M.*, xiii, p. 722] and Gigante [ibid., xv, p. 458] as to the virus origin of potato hollow heart [ibid., xviii, p. 134]. The principal arguments against the virus and in favour of the physiological theory of the etiology of the disease are as follows. Its transmissibility has not been proved. The aerial portions of the plants show no symptoms. There is no decline in yield. The incidence of the disorder is strictly proportionate to the size of the tubers, and the occurrence of the disease is markedly dependent on environmental factors tending to induce either the formation of large tubers or secondary expansion after the cessation of normal growth. Diseased tubers yield exclusively sound progeny under local conditions unfavourable to hollow heart, while even in sites particularly conducive to the trouble a portion of the crop is sound.

BONDE (R.). **Bacterial wilt and soft rot of the Potato in Maine.**—*Bull. Me agric. Exp. Sta.* 396, pp. 675–694, 4 figs., 1939.

Some of the information given in this bulletin on bacterial wilt and soft rot of potatoes (*Phytomonas sepedonica*) [*Bacterium sepedonicum*: *R.A.M.*, xviii, p. 201; xix, p. 235] has already been noticed from another source [ibid., xviii, p. 613], but the following items may be noted. In 1937 and 1938 the disease caused losses in Maine estimated at $32,000 and nearly $80,000, respectively. As a rule, the foliage symptoms do not become evident until late in the growing season. The first symptom in the field is a slight wilting of the leaves and stalks. The affected leaves are mottled, chlorotic, and sometimes pale green, develop marginal necrosis, and gradually die. In some cases the plants are killed. The underground parts of the small stalks of diseased plants sometimes develop longitudinal cracks but the vascular bundles of wilted plants remain normal in colour. Tubers may appear to be

unaffected, or may show symptoms ranging in severity up to complete disintegration [ibid., xvi, p. 628].

PETHYBRIDGE (G. H.). **The Potato blight yesterday and to-day.**—*Polytech. Rep.* (*R. Cornwall Polytech. Soc.*), ix, 3, pp. 48–61, 1940.

In this interesting historical survey of the spread of potato blight (*Phytophthora infestans*) during the early forties of the last century mention is made of a paper, hitherto overlooked, by D. F. Tyerman published in the *Fourteenth Ann. Rep. R. Cornwall Polytech. Soc.*, pp. 9–14, 7 figs., 1846, in which the cause of potato blight was correctly ascribed to a parasitic mould or fungus, though this was not named. The progress made by plant pathologists in the hundred years since the probable record of the disease in St. Helena in 1840 is discussed and the main results are given on the cause and nature of it, factors influencing its development, and means of control.

GRETSCHUSHNIKOFF (A. I.). **Role of peroxidase in immunity against Phytophthora infestans de Bary.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxv, 8, pp. 683–687, 1939.

In further studies on the nature of potato resistance to *Phytophthora infestans* [*R.A.M.*, xviii, p. 271] the following figures were obtained for the activity of peroxidase in potato leaves (expressed as c.c. of n/10 potassium permanganate solution per gm. of fresh leaves): Early Rose (a very susceptible variety) 14·6, *Solanum rybinii* (susceptible) 13·7, Wohltmann (moderately susceptible) 19·0, and No. 8670 (resistant) 21·2. In a second experiment the peroxidase activity (expressed in arbitrary benzidine units per gm. of fresh leaves) was 70·21 in Early Rose, 93·83 in the susceptible Smyslovsky, and 112·81 in No. 8670. The peroxidase activity in the tubers (expressed by the benzidine method) was 2·79 in Early Rose, 3·01 in Wohltmann, and 3·54 in No. 8670. It was thus shown that peroxidase activity in both the leaves and tubers of resistant varieties was higher than in those of lesser resistance and it is concluded that the peroxidase fulfils a protective function against infection by *P. infestans*.

At a soil humidity of 80 per cent. the peroxidase activity (estimated by the benzidine method) was 189·43 for Wohltmann and 137·53 for No. 8670, as compared with 278·89 and 233·49, respectively, at a soil humidity of 20 per cent.; in tubers of the same varieties the corresponding figures were 2·54 and 2·05, and 2·63 and 2·59, respectively. It appears thus that high soil humidity is correlated with low peroxidase activity in both leaves and tubers, although in the latter the peroxidase activity is always much reduced and the dependence on soil humidity is less marked. These results are held to indicate that excessive humidity is conducive to greater danger of infection by *P. infestans*, because it not only favours the development of the fungus but also decreases the resistance of the host plant.

The activity of peroxidase was also found to decrease with shorter day lengths: in leaves of the varieties Early Rose, Wohltmann, and No. 8670 from plants grown at a curtailed day length (eight hours) the decrease in peroxidase activity was 8·1, 48·1, and 35·6 per cent., respectively.

The resistant No. 8670 was found to have both the highest peroxidase and cystoamylase values, while the susceptible Epicure had the lowest, varieties of intermediate reaction having values between these extremes; these results indicate that there is a correlation between the peroxidase and cystoamylase activities. It is suggested that the cystoamylase and peroxidase indices (when determined on comparable material) can be safely used as a basis for the assessment of the resistance of a potato plant to *P. infestans*.

CHIAPPELLI (R.). **Lo sclerozio del Riso.** [The Rice *Sclerotium*.]—*Risicolt.*, xxix, 11, pp. 319–321, 8 figs., 1939.

A popular note is given on the disease of rice caused in Italy by *Sclerotium* [*oryzae*: *Leptosphaeria salvinii*: *R.A.M.*, xvi, p. 405; xvii, p. 128], which in 1939 attacked the Maratelli and Vialone varieties in addition to the normally susceptible Sesia. The substitution of the semi-resistant Chinese Original or American 1600 for the susceptible varieties is indicated in cases of persistent infection.

REYES (G. M.). **Rice diseases and methods of control.**—*Philipp. J. Agric.*, x, 4, pp. 419–436, 15 pl., 1 map, 1 diag., 1939.

In this illustrated survey of rice diseases in the Philippines [*R.A.M.*, vi, p. 371] the following diseases are discussed: *Sclerotium rolfsii* [ibid., xiv, p. 315], *Helminthosporium oryzae*, *Piricularia oryzae*, *Leptosphaeria salvinii* [ibid., xvi, p. 660], *S. sphaeroides* [*Rhizoctonia microsclerotia*: ibid., xv, p. 313], *R. solani*, *Tilletia horrida* [ibid., xv, p. 80], straighthead, various physiological diseases, and the minor diseases *Ustilaginoidea virens*, *Entyloma oryzae*, and *Cercospora oryzae* [ibid., xiv, p. 331; xv, p. 255]. 'Palay lalake' is a comparatively new disease of increasing economic importance. It generally appears about a month after transplanting and is easily recognized in the field by the narrow, light-green leaves and the lanky growth of the affected plants. The pinkish-white mycelium of a species of *Fusarium* [cf. ibid., xiv, p. 120; xv, p. 80] may be seen in the advanced stages of the disease growing on the stem above the water surface, especially around the nodes. The diseased plants should be rogued out as soon as noticed and buried, the stubble burnt, and the diseased field ploughed after harvest. Care should be taken not to spread the disease by mechanical means and seed rice should be taken from disease-free fields. The varieties Macan Bino, Apostol, Macan Biñan, and Guinangang strain 1 proved in some degree resistant to the disease.

RYKER (T. C.). **Physiological specialization in Cercospora oryzae.**—Abs. in *Phytopathology*, xxx, 1, p. 21, 1940.

Leaf spot (*Cercospora oryzae*) is stated to be the most serious disease of Blue Rose rice, the variety normally covering about 75 per cent. of the Louisiana acreage [*R.A.M.*, xvii, p. 201]. From some sound plants collected in a heavily infected field in 1936, a selection, 2854–3, was obtained combining resistance to the pathogen with entire conformity to the Blue Rose type. In artificial inoculation experiments in 1939, however, the new line was completely susceptible, suggesting the existence of more than one physiologic race of *C. oryzae*. To test this hypothesis, 20 cultures of the fungus were used in inoculations on Blue

Rose, Fortuna, 2854–3, and Caloro, with the result that at least three groups were distinguished, namely, (1) Blue Rose susceptible and the other three varieties resistant; (2) 2854–3 susceptible, Blue Rose moderately so, Caloro and Fortuna resistant; and (3) Blue Rose and Caloro susceptible, 2854–3 and Fortuna resistant. Field observations point to the occurrence of yet other races. Some varieties, however, appear to be uniformly resistant to all strains of the parasite.

GHATAK (P. N.) & ROY (T. C.). **Studies in the soil fungi of the Paddy-fields of Bengal. I. Fungi of an unmanured Paddy-field of the Chinsurah Agricultural Farm.**—*J. Indian bot. Soc.*, xviii, 3, pp. 113–127, 16 figs., 1939.

From soil samples from an unmanured rice field on the Chinsurah Agricultural Farm, near Calcutta, the writer isolated on Czapek's medium 23 fungi including, in addition to several Phycomycetes and species of *Aspergillus* and *Penicillium*, *Fusarium dimerum*, *F. orthoceras*, *F. oxysporum*, and *F. solani*.

WEIGERT (J.) & FÜRST (F.). **Die Wirkung von Spurenelementen in den Randgebieten südbayerischer Moore.** [The influence of trace elements on the outskirts of the south Bavarian marshes.]—*Prakt. Bl. Pflanzenb.*, xvii, pp. 117–140, 1939. [Abs. in *Ber. wiss. Biol.*, lii, 11–12, p. 699, 1940.]

Of recent years many economic crops on the outskirts of the south Bavarian marshes, especially oats, barley, summer wheat, maize, hemp, potatoes, and beets, have been suffering from abnormalities of growth entailing substantial losses and in some cases complete failure. The principal disease is grey speck [*R.A.M.*, xix, p. 6], beets being also affected by heart and dry rot. Exhaustive field and pot fertilizer experiments showed the troubles to be due to manganese and boron shortage and controllable by the application of these elements (as manganese sulphate and boron superphosphate) to the soil, the former at the rate of about 50 kg. per hect. and the latter at discretion.

HOERNER (G. R.). **The relation of the climatology of Western Oregon to the incidence and control of downy mildew of Hops.**—*Plant Dis. Reptr*, xxiii, 22, pp. 361–366, 4 graphs, 1 map, 1939. [Mimeographed.]

Hop downy mildew (*Pseudoperonospora humuli*) was first recorded in Oregon in 1930, and has since been reported from every hop-growing county in the western part of the State. While it is true that comparatively low temperatures and high relative humidity favour infection, it must be remembered in attempting to estimate resistance that highly variable local conditions may obtain. Individual plants which had appeared to be highly resistant to natural infection for several years in one breeding garden proved to be very susceptible under epidemic conditions. Spread occurs in the direction of the prevailing winds. Experimental evidence failed to demonstrate that the mycelium is systemic in perennial portions of infected plants. Infections occurring early in the season and resulting in the formation of spiked shoots from apparently healthy crowns have been attributed to oospores that have

overwintered in infected hop residue in the soil. Control measures have therefore been directed to the suppression of early infection by disinfection of the soil round the crowns [*R.A.M.*, xix, p. 166] and protection of the growing plants with a fungicide, but their rapid growth makes it virtually impossible to maintain uniform and complete coverage. A careful study of the climatological data for western Oregon during the past ten years indicated that the monthly mean temperature was not particularly unfavourable to the fungus throughout this period, whereas the monthly mean rainfall was much more variable and more closely correlated with infection. The variations in rainfall were too great to afford any basis for an accurately timed spraying programme. Local growers should apply the main part of their treatments before 1st July; if infection can be minimized until then, the risk of serious loss later should be greatly reduced.

Illitchevsky (S.). Фітопатологічні збори в УРСР. [Phytopathological collections in the Ukrainian S.S.R.]—*ex* Symposium dedicated to the memory of A. V. Fomin, Acad. Mem., Kieff, Ukr. S.S.R. Acad. of Sci. Press, pp. 149–157, 1938. [Received February, 1940. English summary.]

This is a list of 137 parasitic fungi, chiefly Uredinales, collected by the author since 1923 in the Ukrainian S.S.R. Mosaic mottling of lilac [*R.A.M.*, xiv, pp. 462, 494], characterized by wilted and dried leaves, is recorded as prevalent in two localities in 1932 and 1933, respectively.

Wang (Y. C.) & Martens (P.). **Sur l'origine de la dicaryophase chez quelques Urédinées.** [On the origin of the dicaryophase in some Uredineae.]—*Trav. biol. Inst. J. B. Carnoy, Louvain*, 33, pp. 215–245, 81 figs., 1939.

This is an exhaustive account of the writers' studies on the origin of the binucleate phase in the rusts *Puccinia caricis* on *Urtica dioica*, *P. coronata* [*R.A.M.*, xii, p. 164] on *Rhamnus frangula*, *P. poarum* on *Tussilago farfara*, *Uromyces poae* on *Ranunculus ficaria*, and *P. malvacearum* [ibid., xii, p. 782] on *Malva rotundifolia*. A number of observations were made pointing to the intervention of pycnospores in the initiation of dicaryopsis, e.g., pycnospores apparently in process of germination or conjugation on the leaf surface, a pycnospore affixed to a paraphysis or a pycnophore, and paraphyses with supernumerary nuclei. On the other hand, in the foliar tissues, among the pycnidia, young aecidia, and the bulk of the uninucleate cells occur frequent binucleate cells, cells with conjugate mitoses, occasionally binucleate cells delimited by typical clamp-connexions ['anses d'anastomose'], and binucleate cells with one nucleus in course of division. As regards the aecidia, the initiation of the first dicaryon at the expense of a lateral fusion between two fertile cells (Christman's 'two-legged cells': *Bot. Gaz.*, xxxix, pp. 267–275, 1905) was in no case observed, and in fact this mode of origin is contra-indicated by some aspects of the present investigations. In *P. caricis* the binucleate cell at the base of one or more chains of aecidiospores receives its two nuclei from a regularly plurinucleate cell underlying the fertile cells. Hyphae presenting an

appearance of 'receptivity' were detected only in the single species (*P. malvacearum*) destitute of pycnidia.

Brown (A. M.). **The sexual behaviour of several plant rusts.**—*Canad. J. Res.*, Sect. C., xviii, 1, pp. 18–25, 3 pl., 1940.

In greenhouse experiments in Ottawa, the following three rusts proved to be heterothallic: *Uromyces trifolii hybridi*, *Phragmidium speciosum*, and *U. fabae*. All produced well-developed pycnidia and *U. fabae* occasionally omitted the aecidial stage or produced uredosori and aecidia in association. On the other hand, *Puccinia coronata elaeagni* [*R.A.M.*, xii, p. 362], *P. grindeliae*, and *P. xanthii*, are homothallic, single sporidia of these species giving rise spontaneously to binucleate infections. Ashworth's conclusion [*Trans. Brit. mycol. Soc.*, xvi, pp. 177–202, 1931] that *P. malvacearum* is homothallic was also confirmed.

Since all the rusts so far known to be heterothallic possess well-developed pycnidia, while in the four homothallic species pycnidia are either absent or under-developed, it would appear that the presence of pycnidia may be taken as an indication of heterothallism and their absence or under-development of homothallism.

Fisher (Eileen E.). **Notes on some Australian sooty moulds.**—*Ann. Bot., Lond.*, N.S., iv, 13, pp. 195–197, 1 fig., 1940.

A new combination, *Chaetothyrium citri* (Arn.) Fisher, is proposed for *Pleosphaeria citri* (syn. *Aithaloderma citri*), a fungus recorded for the first time in Australia, on *Alyxia buxifolia* and *Bursaria spinosa*. A description [with a Latin diagnosis] is also given of a new species, *Phycopsis australiensis*, found on leaves of *B. spinosa* in Victoria [cf. *R.A.M.*, xviii, p. 627].

Thom (C.) & Raper (K. B.). **The Aspergillus nidulans group.**—*Mycologia*, xxxi, 6, pp. 653–669, 6 figs., 1939.

The authors divide the *Aspergillus nidulans* group into five species based primarily on ascospore characters, viz., *A. nidulans*, *A. quadrilineatus* n.sp., *A. rugulosus* n.sp., *A. variecolor* n. comb. (syn. *Emericella variecolor* Berk & Br.), and *A. unguis* n. comb. A new variety, *A. nidulans* var. *latus*, is described, and Yuills' *A. nidulans* mut. *albus* [*J. Bot.*, Lond.; in the press] is accepted.

Wallace (J. M.). **Evidence of passive immunization of plants from curly top.**—Abs. in *Phytopathology*, xxx, 1, pp. 26–27, 1940.

Following recovery from curly top [in California], Turkish tobacco plants showed mild symptoms and did not react perceptibly to re-inoculation [*R.A.M.*, xviii, p. 823]. However, leafhopper transmission from recovered plants induced severe manifestations, denoting the unimpaired virulence of the infective principle. Graft transmission, on the other hand, resulted in mild symptoms, indicating the presence in the recovered plants of protective substances or properties transferable by grafting. The results of tests in which scions from leafhopper-inoculated plants were grafted on to healthy ones at five-day intervals following inoculation showed that a minimum period of 20 days was

necessary for the inoculated plants to develop their maximum protective action. It was further shown that tomato plants belonging to varieties with little natural propensity for recovery from curly top [loc. cit.] could be afforded partial protection by grafting with recovered tobacco plants. Once established in the tomato plants, the protective influence persisted through several serial cuttings for over a year and was transmissible to other healthy tomato and tobacco plants. This appears to be the first record of the particular type of passive immunization under review.

COSTA (A. S.) & FORSTER (R.). **Uma suspeita moiéstia de virus do Fumo (Nicotiana tabacum L.), semelhante a 'leaf curl' presente no Estado de São Paulo.** [A suspected virus disease of Tobacco (*Nicotiana tabacum* L.) resembling 'leaf curl' present in the State of São Paulo.]—*J. Agron., S. Paulo*, ii, 5, pp. 295–302, 9 figs., 1939. [English summary.]

During the period 1938–9 a disease of tobacco resembling leaf curl was observed to be present to the extent of 1 to 5 per cent. in plantings of the Kentucky variety in the Piracicaba district of São Paulo, Brazil. Other varieties affected include Goiano, Flor branca, Virginia, Amarelinho, and Creoulo de Bragança, besides *Nicotiana sylvestris*. The disorder assumes three forms, two of which are common and are designated as the 'rugose' and 'leaf roll' types, the former corresponding to Thung's 'common kroepoek' and the latter (in part) to his 'transparent' [*R.A.M.*, xi, p. 478]: no description is given of the third, apparently very rare type, hitherto observed on one plant only. Unlike leaf curl, the São Paulo disease was not found to be transmissible by grafting and no insect vector is known, so that its nature remains for the present obscure.

TROTTER (A.). **Una interessante mutazione teratologica nel Tabacco 'Aja Soluk' affine al 'kroepoek' riscontrata nel Leccese.** [An interesting teratological mutation in 'Aja Soluk' Tobacco related to 'kroepoek' encountered in the province of Lecce.]—*Boll. tec. Tab.*, xxxvi, 4, pp. 193–202, 4 pl., 2 figs., 1939. [English summary.]

The author's attention was recently drawn to a foliar anomaly in the Aja Soluk tobacco variety first observed in the province of Lecce, Italy, by M. Donadoni in 1932 and shown by him to be transmitted by the seed. The enations and other peculiarities of the leaves closely resemble those of 'kroepoek' [see preceding abstract], but in the present instance the disorder is regarded as more likely to be due to an hereditary teratological mutation than to a virus.

JOHNSON (E. M.), DIACHUN (S.), & VALLEAU (W. D.). **Experimental production of blackfire on Tobacco.**—*Phytopathology*, xxx, 1, pp. 73–79, 3 figs., 1939.

Large, zonate lesions, closely resembling those occurring in natural late-season epidemics of tobacco 'blackfire' (the term applied to the concentric type of spot produced under humid conditions on the leaves of topped plants by *Bacterium tabacum* or *Bact. angulatum*) developed

both on the White Burley and dark varieties as a result of spraying the foliage in the field and greenhouse at the Kentucky Agricultural Experiment Station with suspensions of virulent isolates of the causal organisms. In both series of experiments the spots expanded during the night with the accumulation of dew on the leaves in the field and the formation of a water film, which did not, however, induce water-soaking [*R.A.M.*, xix, p. 123], by an artificial fog in the greenhouse. The wet, necrotic, advancing border thus formed turned dry and brown in the course of the day. Dead areas 3 to 4 in. in diameter were formed by the extension of individual spots and the coalescence of adjacent diseased areas. This is believed to be the first report of the experimental production of the zonate blackfire lesions by pure culture inoculations under controlled conditions.

McLean (Ruth) & Pinckard (J. A.). **Field studies on paradichlorobenzene in the control of Tobacco downy mildew.**—Abs. in *Phytopathology*, xxx, 1, pp. 16–17, 1940.

In further experiments on the value of para-dichlorobenzene vapour in the control of tobacco downy mildew [*Peronospora tabacina*: *R.A.M.*, xviii, p. 419; xix, p. 242], 3 to 4 lb. No. 6 size crystals were broadcast on the ordinary cotton cover in a given seed-bed of 100 sq. yds. following the appearance of the pathogen. A cotton fumigation cover of 64 warp and 64 woof per in. was drawn over the treated bed and left in position for 24 hours. On farm-operated seed-beds three nightly 12-hour treatments sufficed to eliminate the fungus at a temperature exceeding 6° to 8° C., while on warm nights one such application may be adequate, using wet or sealed fumigation covers. Treatments made nightly and on alternate nights with half the quantity of para-dichlorobenzene mentioned above were likewise effective, but seedling injury resulted from experiments with shorter day treatments.

Pinckard (J. A.) & McLean (Ruth). **A laboratory method for determining the fungicidal value of vapors and its application to paradichlorobenzene in the control of Tobacco downy mildew.**—Abs. in *Phytopathology*, xxx, 1, p. 19, 1940.

Known concentrations of para-dichlorobenzene vapour, approximating to a precision of three parts per 1,000, were delivered to tobacco seedlings infected with downy mildew [*Peronospora tabacina*: see preceding abstract] in jars continuously or intermittently, beginning on the third day after inoculation, the sporangial cycle of the pathogen being six days. Sporangial production was suppressed without damage to the host by single and alternate 12-hour treatments, the former being effective at concentrations equal to saturation above 7° C. (0·02 volume per cent.) and the latter at 0° (0·01). Concentrations at or above 13° (0·04 volume per cent.) caused injury to the plants after 12 hours. The vapour induces modifications in the pathogen or host, or both, involving the destruction or inhibition of the former without appreciable harm to the latter. In order to exert a fungicidal effect, the vapour must be soluble in the cell plasma. This method, therefore, gives results that at best are merely indicative of the important tissue concentrations which depend on the partial pressures.

Clayton (E. E.) & Foster (H. H.). **Disease resistance in the genus Nicotiana.**—Abs. in *Phytopathology*, xxx, 1, p. 4, 1940.

Over 1,000 collections of tobacco (*Nicotiana tabacum*, n = 24) from all known areas of its range have been tested for their reactions to blue mould [downy mildew] (*Peronospora tabacina*), black root rot (*Thielaviopsis basicola*), wildfire (*Bacterium tabacum*), bacterial wilt (*Bacterium solanacearum*), and mosaic. Resistance was strongly developed in respect of *T. basicola* and mosaic, but only of a slight to moderate order in the case of the other diseases, being recessive and conditioned by multiple factors as regards *Bact. solanacearum* and *P. tabacina*. Among the more promising of about 30 other *N.* spp. studied from the disease resistance angle are *N. debneyi* (n = 24), apparently immune from *P. tabacina* and *T. basicola*, and resistant to *Bact. tabacum*; *N. glauca* (n = 12), immune from *T. basicola* and highly resistant to mosaic and *Bact. tabacum*; *N. repanda* (n = 24), characterized by vigorous resistance to *Bact. tabacum* and *T. basicola*; and Smith's allo-polyploid (*N. tabacum* × *N. glauca*, n = 36), resistant to *T. basicola*. A reserve of resistance approximating to immunity is thus available for all the diseases under investigation except bacterial wilt.

Ghimpu (V.). **Les maladies et les insectes nuisibles au Tabac en Roumanie.** [Diseases and insects harmful to Tobacco in Rumania.]—Reprinted from *Bul. Soc. Şti. agric., Bucureşti*, i (*1938–39*), 7 pp., 1939.

Losses caused to the tobacco crop in Rumania through diseases [*R.A.M.*, xvi, p. 344] and insect pests are estimated to amount to 100,000,000 lei annually [approximately £125,000]. Virus diseases are responsible for the greatest losses in the field. Common mosaic is very prevalent and was studied in Bessarabia fifty years ago. It generally appears in the vicinity of Bucarest towards the end of May. Yellow and aucuba mosaics are rare and unimportant. White mosaic occurs regularly and ring spot is most prevalent near villages. Spot necrosis (caused by two potato viruses) is fairly common, and was very troublesome in 1934 in the vicinity of potato plantings. Streak was recorded in 1935.

Bacterial diseases are very harmful in the seed-beds during April and in the field during June. The most important is *Bacterium tabacum*, which often causes losses up to 25 per cent., but by adopting phytosanitary methods this disease has been eliminated from the experimental field at Băneasa. *Bact. melleum* [ibid., xvi, p. 214], *Bact. angulatum*, and *Bact. solanacearum* also occur.

In the seed-beds *Pythium de Baryanum* and *Rhizoctonia* [*Corticium*] *solani* are the most dangerous fungal pathogens, infection being favoured by rainy or cloudy weather and excessive irrigation. *Phyllosticta nicotianae* frequently attacks field crops in June, but does not cause important damage. The mycelium overwinters in tobacco trash in the drying sheds. *Ascochyta nicotianae* appears in May when the temperature is between 12° and 27 °C. *Alternaria tenuis* and *A.* sp. occur frequently both in the seed-beds and the field. *Erysiphe cichoracearum* occurs in glasshouses and plantations where shade is excessive. Other fungi

found on tobacco include *Asterocystis radicis* [*Olpidium brassicae*: see above, p. 263], *Phytophthora nicotianae, Thielaviopsis basicola, Fusarium oxysporum* var. *nicotianae, Nigrospora oryzae* (causing a leaf spot), and *Helminthosporium turcicum* (on seedlings). *Aspergillus fumigatus* is included in a list of 15 moulds recorded during the curing process.

Of the non-parasitic troubles noted a female sex-linked variegation is said to occur frequently.

GOLDIN (M. I.). **A virus strain of mosaic disease of the aucuba-type in Tomato.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxv, 7, pp. 630–632, 1 fig., 1939.

In the course of microscopic examination of the protein inclusions encountered in tissues of plants affected with tobacco mosaic, a method of diagnosis widely applied on one of the State vegetable farms near Moscow, the author met with a virus, designated strain A, which differed from the virus of ordinary tobacco mosaic. Seedling tomato plants infected by strain A developed strikingly deformed filiform leaves, yellow mosaic symptoms appearing after one to two months. The strain caused local necroses on leaves of *Nicotiana sylvestris*, but no mosaic, thus differing from ordinary tobacco mosaic and resembling the aucuba mosaic virus. Furthermore, tissues of tomato plants infected with strain A showed similar intercellular inclusions to those characteristic of the aucuba mosaic virus (namely, solid, brownish, granulated or oval inclusions, long needles, and, rarely, hexagonal crystals). The strain A retained all its properties when heated at 70° [C.] for 25 minutes. It is concluded that this variant is a type of aucuba mosaic not previously recorded in the U.S.S.R. The author also observed an 'enation' virus causing outgrowths from the lower surface of the leaf blades in tomato and tobacco plants, and producing peculiar modifications in the leaf veins, which appear to be inverted, so that the hairs are on the upper instead of on the lower side of the blade.

ALEXANDER (L. J.). **A new strain of the Tomato leaf mold fungus Cladosporium fulvum.**—Abs. in *Phytopathology*, xxx, 1, p. 1, 1940.

Continuing his work [in Ohio] on the breeding of tomatoes for resistance to leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xvii, p. 419], the writer reports that the new variety Globelle, formerly as resistant as one of its parents, *Lycopersicum pimpinellifolium*, developed a susceptible response to infection which was subsequently shown to be due to the appearance of a new physiologic race of the pathogen, also attacking *L. pimpinellifolium*. In cross-inoculation tests Globe and Globelle plants proved uniformly susceptible to spores of the fungus collected on the leaves of the latter variety, but when individuals of the two varieties were inoculated with spores from diseased Globe foliage procured from a distant site, Globelle was highly resistant and Globe susceptible.

HARRISON (A. L.). **A method for testing resistance of Tomatoes to Fusarium wilt.**—*Phytopathology*, xxx, 1, pp. 86–87, 1 fig., 1940.

Thousands of young tomato plants were successfully inoculated in varietal reaction trials at the Texas Agricultural Experiment Station

in 1939 with the causal organism of wilt (*Fusarium bulbigenum* var. *lycopersici*) [*R.A.M.*, xix, p. 170] by the immersion of the roots for five to ten minutes in four- to seven-day-old liquid nutrient cultures, followed by immediate transplantation to flats or cold frames. Of the 1,200 seven-week-old seedlings inoculated on 24th February and showing the first symptoms of wilt on 15th March, only 33 lived long enough to produce any seed and none was free from vascular disoloration. By the 25th day after inoculation all the plants of the susceptible Gulf State Market variety had collapsed, while most of the resistant Louisiana Pink and Louisiana Dixie were still healthy, though many succumbed at a later stage. The wilt-resistance ratings obtained by this method were found on comparison to be of the same order as, but somewhat lower than, those secured under severe wilt conditions in the field, indicating superior selectivity as a feature of the root-immersion technique.

MILLER (P. W.). **Nut diseases in the Pacific Northwest in 1939.**—*Plant Dis. Reptr*, xxiii, 20, pp. 334–337, 1939. [Mimeographed.]

Brief, popular notes are given on diseases of Persian [English] walnuts [*Juglans regia*] and filberts [*Corylus avellana*] in the north-western sections of the United States in 1939. Diseases of the former host included bacterial blight (*Phytomonas* [*Bacterium*] *juglandis*) [*R.A.M.*, xviii, p. 423], ring spot (*Ascochyta juglandis*) [ibid., xiv, p. 204], downy spot (*Microstroma juglandis*) [ibid., xvi, p. 642], and the non-parasitic leaf scorch [ibid., xv, p. 587], freckle spot, sun scald, and 'black line'. The last-named [cf. ibid., xii, p. 601], characterized by girdling of the bark at the graft union, killed a large number of 12- to 24-year-old trees in Oregon. The affected trees were English walnuts of the Vrooman Franquette variety on California black walnut rootstocks. The disorder has never been observed on Franquettes topworked or grafted on English walnut rootstocks.

The filbert diseases dealt with include blight due to a species of *Bacterium* [closely resembling *Bact. juglandis*: ibid., xviii, p. 424], mildew (*Phyllactinia corylea*) [ibid., xvi, p. 21], and the non-parasitic disorders leaf scald (which mostly affected orchards on shallow soils and was of considerable economic importance, as it caused appreciable decrease in functional leaf area and, in some cases, premature leaf fall), brown stain [ibid., xi, p. 683], 'blanks' (causing embryo abortion, and resulting, in 1939, in crop losses of 5 to 40, average about 15, per cent.) [cf. ibid., v, p. 118], sun scald, and drought injury.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes. X.**—*Pap. Mich. Acad. Sci.*, xxiv, pp. 167–188, 7 pl., 1939.

Included in this critically annotated list of 13 resupinate Polypores from the Great Lakes region of the United States and Canada [*R.A.M.*, xvii, p. 635] are two new species [with Latin diagnoses], viz., *Polyporus tacamahacae*, isolated from balsam poplar (*Populus balsamifera*) in Alberta, and occurring also on *P. trichocarpa*, and *Polyporus illinoisensis*. *P. tacamahacae* is characterized by whitish to very pale green, somewhat glossy, annual fructifications, with a distinct whitish

margin, forming a skin-like sheet about 1·5 mm. thick over the bark; a white to cartridge-buff subiculum, up to 2 mm. thick; tubes 2 mm. long or up to 3·5 mm.; whitish or pale green mouths, 5 to 6 per mm., drying to cream or colonial buff or Verona brown; basidia 9 to 18 by 3 to 4 μ; spores 4 to 5·5 by 1 to 2 μ; and hyaline, extensively branched hyphae, 1 to 3 μ in diameter. The fungus makes rapid growth on malt agar, especially in the dark, and falls in the 'average temperature' and 'wide range' groups of the Polyporaceae. It was also found in the Northwest Territories (Canada), Idaho, Michigan, Nebraska, and New York.

P. illinoisensis, isolated from *Cephalanthus occidentalis*, in Michigan and Illinois, resembles *P. farlowii* except in its semi-resupinate habit, dark brown setae, 13 by 4 μ, and slightly smaller, yellow or light brown spores, 4 to 4·5 by 3 to 3·5 μ.

Baxter (D. V.) & Manis (W. E.). **Polyporus ellisianus (Murr.) Sacc. & Trott. and Polyporus anceps Pk. in culture: a study of isolates from widely separated forest regions.**—*Pap. Mich. Acad. Sci.*, xxiv, pp. 189–195, 3 pl., 1 fig., 1939.

The numerous variations in malt and water agar cultures of eight isolates of the fungi referred to in the relevant literature as *Polyporus ellisianus* [*R.A.M.*, x, p. 571; xi, p. 615] and *P. anceps* [ibid., xii, p. 341; xviii, p. 4], causing severe decay of pine (*Pinus ponderosa*) in the south-western United States and prevalent on black spruce (*Picea glauca*) in the Northwest Territories, Canada, point to the existence of different races or strains within the species. On the other hand, the known morphological distinctions are not regarded as sufficient to separate the two species.

Spaulding (P.). **Spongy white rot of hardwoods (Fomes connatus (Weimann) Gillet).**—*Tree Pest Leafl. Soc. Amer. Foresters, New England Sect.*, 38, 4 pp., 3 figs., 1939.

This is a popular account of the fungus *Fomes connatus* [*R.A.M.*, xviii, p. 280] occurring on various forest, street, and ornamental trees (of which 21 are listed) in the United States, and the means of control.

Tyler (L. J.), Parker (K. G.), & Pope (S.). **Relation of wounds to infection of American Elm by Ceratostomella ulmi, and the occurrence of spores in rainwater.**—*Phytopathology*, xxx, 1, pp. 29–41, 1940.

In the course of four years' field observations in and near New York City the writers noted the frequent production of the coremia of *Ceratostomella ulmi* in more or less exposed sites, not only on diseased elms but on apparently uninfected trees in an enfeebled condition. The organs were detected, for instance, on the outer surface of the inner bark protruding into the space formed by the loosened and partly raised outer rough bark, in *Scolytus* beetle entrance holes and feeding wounds, and in the openings into leopard moth [*Zeuzera pyrina*] galleries. In laboratory experiments the spores of the fungus were easily dislodged from the fruiting structures by means of a water spray, but only to a limited extent, dependent on a variety of factors, by air

currents [*R.A.M.*, xvii, p. 143]. Rain water collected during the summer of 1937 and 1938 from 32 diseased field elms yielded *C. ulmi* in pure culture in nine cases.

The infection of potted American elms (*Ulmus americana*) readily followed the introduction of *C. ulmi* spores into fresh wounds extending into the root, trunk, and branch wood. Positive results also followed the application of inoculum to the freshly exposed but uninjured wood surface, while mild symptoms, unaccompanied by wilting, were sometimes obtained when spores were inserted in the leaf traces, in injured midribs, or in the succulent portions of newly formed or developing shoots. The application of spores to unwounded surfaces or to superficial cortical injuries, not involving the wood, gave negative results. The introduction of *C. ulmi* spores into the soil round wounded roots caused infection at any time from 2nd April to 3rd November, inclusive, the period of maximum invasion extending from 25th May to 1st September. Trees inoculated before the buds began to swell and up to the time the new shoots reached a length of 1 to 3 in. mostly contracted infection, but seldom or never in a severe form, whereas severe wilting, die-back, and fungal discoloration resulted from inoculation from 25th May to 1st or 15th July, when terminal shoot growth was completed. Inoculation during the period between the cessation of terminal growth and early September frequently induced considerable discoloration but little die-back. The high moisture conditions (85 to 98 per cent. relative humidity) of moist chambers were more conducive to infection in trees inoculated through wounds on aboveground parts than the comparatively dry atmosphere (40 to 80 per cent.) of a greenhouse with open ventilators, coremia being produced exclusively in the former environment.

Lepik (E.). **Estonia. The Elm disease in the country.**—*Int. Bull. Pl. Prot.*, xiv, 1, p. 2, 1940.

Ceratostomella ulmi, which probably made its first appearance in Estonia between 1930 and 1935, has now been observed in eleven districts throughout the country, causing extensive wilting.

Leach (R.). **Biological control and ecology of Armillaria mellea (Vahl) Fr.**—*Trans. Brit. mycol. Soc.*, xxiii, 4, pp. 320–329, 2 pl., 1939.

Further studies on the ecology of *Armillaria mellea* on tea in Nyasaland and its biological control by ring-barking [*R.A.M.*, xvi, p. 564] are described. As in other parts of tropical Africa, *A. mellea* develops rhizomorphs only sparsely, the longest found by the author being 18 in. long. Infection is caused largely by root contact, and the continual replacement of young tea bushes attacked by the fungus has proved to be the only successful method of treatment in young tea gardens. Affected bushes appear unthrifty for six months or a year before death. As a result of the carbohydrate depletion caused when the fungus completely girdles the tap-root of a tea bush, a few lateral roots below the girdled zone are generally invaded by *Rhizoctonia lamellifera*; where the dry-rotted tissues of such laterals meet tissues invaded by *A. mellea*, the latter forms a black zone line and makes no further progress.

Similarly, *A. mellea* on penetrating roots of *Parinarium mobola* invaded by unidentified fungi formed a zone line round the affected wound area.

In an experiment made to test the practical application of the antagonism between *A. mellea* and other fungi, woody prunings were left on top of the soil for one month and allowed to become infected with saprophytes, after which they were buried next to fresh woody prunings, *Gliricidia sepium* roots infected with *A. mellea* being placed in contact with both sets of prunings. After one month the fresh prunings had become heavily infected by *A. mellea*, whereas the dead ones were unaffected; this result was confirmed when the experiment was repeated in the laboratory. Planters should leave their heavier prunings above ground for at least a month if they do not wish to incur the expense of removing them.

Test-tube cultures of *A. mellea* on blocks of *P. mobola* root with bark adhering showed that numerous dark brown strands of xylostroma broke through the bark of sterilized healthy roots, whereas the xylostroma failed to rupture the bark of sterilized roots from trees ring-barked a year before. This reduction in xylostroma development sometimes occurs naturally in a lateral root of tea infected by *A. mellea*. It is thus apparent that ring-barking would reduce the infectivity of the roots of a tree attacked by *A. mellea* after ringing, since penetration of the strands of xylostroma through the bark and the development of rhizomorphs would be reduced.

To cause depletion of the roots as rapidly as possible by ring-barking, deciduous trees should be ringed just after breaking into leaf. Trees which die slowly after ring-barking should be felled one year after ringing. All sucker growth on the trunk below the ring and from the surface roots must be suppressed.

An experiment [which is described] made to ascertain the relative susceptibility to *A. mellea* of felled and standing indigenous trees showed that nearly every species of tree found in the tea districts of Nyasaland is a potential host of the fungus though the roots of a few species only are commonly associated with root rot of tea. The roots of most species normally localize infection but when severed the fungus travels in them freely. Other experimental evidence, besides supporting the view that control results from ring-barking, indicated that trees growing near dead stumps in forests may have many localized lesions of *A. mellea* dormant in the roots, in which the fungus may become active when the forest is felled for a plantation crop. It may spread from these localized lesions even though the roots of the original dead stumps may have been rotted by *A. mellea* too far to be capable of producing infection.

The rate at which roots die after the tree is felled is believed to be the factor controlling the distribution of *A. mellea* in cleared forests. Roots of quickly dying trees become invaded by saprophytes and consequently cannot be attacked by *A. mellea*. Such roots probably form a barrier in the soil, through which *A. mellea* is unable to spread should it approach along the moribund roots of the slowly dying trees. This may explain why root disease is so often found in small, isolated patches of tea planted on the site of a mixed forest. The species of tree most dangerous as sources of infection are those whose roots die very slowly after felling, such as *Afrormosia angolensis* and *P. mobola*, since

Armillaria mellea can spread unimpeded along a network of moribund but still susceptible roots.

HEPTING (G. H.). **A vascular wilt of the Mimosa tree (Albizzia julibrissin).**—*Circ. U.S. Dep. Agric.* 535, 10 pp., 3 figs., 1939.

Further investigations are reported into the highly destructive wilt disease of the mimosa tree (*Albizzia julibrissin*) [*R.A.M.*, xv, p. 758], widely grown in the southern United States as an ornamental. The disease was first observed in 1935 at Tryon, North Carolina, but is reported by local residents to have been present since 1930. It has since spread to many widely scattered localities in the south-east and has killed several thousand trees. A survey made in Tryon in 1938 showed the mortality of the street trees due to wilt to be about 70 per cent. Death of the tree usually occurs within a year from the first appearance of wilting, but has been known to take place in trees 15 to 20 ft. tall within a month. At the time of wilting a brown ring or partial ring of discoloured sapwood can be found in the trunk and later this extends to the branches. Isolations made from the discoloured sapwood of affected trees from seven localities yielded consistently a *Fusarium* of the *Elegans* section, which is named *F. perniciosum* n.sp.; an isolate from trees at Wisacky appeared slightly different, and it is left to further study to determine whether it is a morphological variant of *F. perniciosum* or a distinct species. Inoculations made with both forms were successful. *F. perniciosum* is described [with a Latin diagnosis] as follows: the mycelium is at first colourless, turning later rose-purple and magenta or darker; microconidia are formed abundantly in false heads, and are typically ovoid, unicellular, white to buff-pink in the mass; macroconidia are produced usually on sporodochia or sometimes on aerial mycelium, are uni- to tri-septate, curved, gradually attenuated towards both ends, typically triseptate, 23 to 32 by 3·9 to 4·9 μ; and the chlamydospores are terminal, intercalary, intraconidial or attached to conidia, globose to piriform, with a mean diameter of 7 μ.

Fruiting bodies of several species of *F.* were frequently found on bark of wilting or dead trees, but none belonged to the *Elegans* section, which includes all the species of *F.* known to cause wilt. It is believed that Voronikhin, who investigated a similar disease in Russia [loc. cit.], was dealing with one of these secondary species.

The disease has been observed on soils ranging from clay to sand, from acid to alkaline (P_H 4·5 to 7·8), and from elevations near sea-level to 2,200 ft., but the known infection areas do not appear to form a definite geographical pattern. The disease is probably soil-borne, and transportation of soil, either directly or attached to the roots of plants, from areas of known infection should be discouraged. Planting stock should be selected from definitely disease-free areas. No means are at present known to check the spread of the disease in areas where it has become established, and in such areas it would be best to replace the mimosa by other species. As a measure of precaution pruning and other wounds should be disinfected and covered with a serviceable coating, and tools employed on suspected trees sterilized before use on healthy mimosas.

KIMMEY (J. W.). **Time of growth of Cronartium ribicola cankers on Pinus monticola at Rhododendron, Oregon.**—*Phytopathology*, xxx, 1, pp. 80–85, 2 graphs, 1940.

The seasonal fluctuations in the growth rate of 117 blister rust (*Cronartium ribicola*) cankers on 19 western white pines (*Pinus monticola*) [*R.A.M.*, xviii, p. 72] were studied at an elevation of 1,650 ft., at Rhododendron, Oregon, from 1934 to 1937, inclusive. Two series of cankers were used, 52 on 12 trees from March 1934 to June 1935, and 65 on 7 from March 1936 to May 1937.

There were great differences in the seasonal growth periods of the individual cankers, and to a lesser extent between their two ends. Development was rapid from April to November and ceased for up to three months or even longer during the winter. About 90 per cent. of the annual increment was laid down between 1st April and 1st November, as against only 2·5 per cent. from December to February. A correlation was observed between the prevailing temperature and canker growth, rapid expansion being promoted, for instance, by the exceptionally warm spring of 1934, and a severe check to development following the abnormally cold weather in January of 1935 and 1937, and the unusually cool springs of the same years. The time of the rupture of the peridia on blister rust cankers and that of the breaking of buds on deciduous trees in the spring may be regarded as probable indicators of the commencement of canker growth acceleration, the corresponding period of retardation in the autumn synchronizing with the fall of the leaves in the autumn.

RIKER (A. J.) & KOUBA (T. F.). **White Pine selected in blister-rust areas.**—Abs. in *Phytopathology*, xxx, 1, p. 20, 1940.

Most of the small white pine [*Pinus strobus*] trees in unprotected areas of Wisconsin are stated to have been killed by the invasion of *Cronartium ribicola* [*R.A.M.*, xix, p. 247], but the survival of, say, one out of 300 to 500 trees in an apparently healthy condition for several years led to a search in 1938 and 1939 for cones from such resistant individuals for propagation. Four selected areas yielded 163 trees which had withstood natural infection by the rust for 15 to 20 years without evidence of canker formation. Recent surveys disclosed some 10,000 to 60,000 ft. of *Ribes* live stem per acre. Preparatory to exposure to natural and artificial infection at a suitable age, the cones from each of the seemingly resistant pines were planted in separate rows in the nursery and veneer grafts with scions from 40 parent trees successfully made in the spring of 1939.

CHILDS (T. W.). **Decay of slash on clear-cut areas in the Douglas Fir region.**—*J. For.*, xxxvii, 12, pp. 955–959, 1939.

The examination, from 1928 to 1931 and again in 1936–7, of logging debris on 135 representative slashings west of the Cascade Mountains in Oregon and Washington, indicated that fungal decay is too slow to facilitate fire control materially. The average branch volumes of Douglas fir (*Pseudotsuga taxifolia*) decayed after 16 to 20 years were 60 and 50 per cent. for small and large branches, respectively, the corresponding figures for western hemlock (*Tsuga heterophylla*) and Sitka spruce

(*Picea sitchensis*) after 11 to 15 years being 91 and 81 and 85 and 75 per cent., respectively. The fungi concerned in the rotting include *Lenzites sepiaria*, *Fomes pinicola*, *F. subroseus* [*R.A.M.*, xviii, p. 505], *Polystictus abietinus* [ibid., xviii, p. 562], *Ganoderma oregonense* [ibid., xi, p. 615], *F. applanatus* [*G. applanatum*], and *Schizophyllum commune* [ibid., xix, p. 175], while *P.* spp. (chiefly *P. cuneatus*) [ibid., viii, p. 541] are mainly responsible for damage to western red cedar (*Thuja plicata*). The heat- and drought-tolerant *L. sepiaria* causes more than one-third of the decay of sapwood, except in Douglas fir on unburned slashings in the spruce-hemlock type, while *F. pinicola* is the most important single cause of heartwood rotting, though *L. sepiaria* and *F. subroseus* are very prevalent in hemlock and Douglas fir heartwood, respectively. Sporophores are seldom found on slash less than three years old, and are most abundant from four to six or seven years after logging. Both *F. subroseus* and *F. pinicola* are capable of attacking living trees, but the sporophores of these fungi are rare in the region under observation on slashings old enough for the reproduction to have become susceptible.

VERRALL (A. F.). **Relative importance and seasonal prevalence of wood-staining fungi in the United States.**—*Phytopathology*, xxix, 12, pp. 1031–1051, 1 fig., 2 graphs, 1939.

Staining of hardwood logs and timber in Louisiana, Mississippi, and Georgia was shown by intensive studies and inoculation experiments in 1937–8 to be principally due to *Endoconidiophora coerulescens* [*R.A.M.*, xiv, pp. 270, 729], *Ceratostomella pluriannulata* [ibid., xv, p. 69], *Diplodia natalensis* [ibid., xiv, p. 729], and *Graphium rigidum* [ibid., xix, p. 57], all of which occurred indiscriminately on red gum (*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), *Platanus occidentalis*, oaks, *Nyssa* sp., beech, *Magnolia*, and hickory, the first-named being perhaps the most susceptible. Pines (*Pinus palustris*, *P. taeda*, *P. caribaea*, and *P. echinata*) sustained the heaviest damage from *C. pilifera* [ibid., xviii, p. 488], *C. ips* [ibid., xviii, p. 772], *D. natalensis* [ibid., xvi, p. 219], and an apparently undescribed *D.* sp., possibly a variety of *D. megalospora* [ibid., xvi, p. 787]. It is characterized on malt agar at 28° to 30° C. by carbonaceous, inverted-clavate or globose, rostrate, ostiolate, smooth pycnidia, 202 to 386 by 151 to 269 μ; simple, hyaline conidiophores 20 to 32 by 2 μ, bearing conidia at first unicellular and hyaline but becoming golden-brown at maturity, with 0 to 3 septa but mostly uniseptate, granular, slightly clavate and tapering towards the base or truncate, 32·4 to 42 by 12 to 16 (which may be 37·3 by 13·7) μ. Fungi of minor importance isolated from hardwoods included *E. moniliformis* [ibid., xix, p. 57] (also from pine), a *Torula* allied to *T. ligniperda* [ibid., xii, p. 123], *Alternaria* spp. (also from pine), *Cladosporium* sp. (also from pine), *Helminthosporium geniculatum* (also from pine), two or more species of *Leptographium* (one also from pine), and *G.* spp., while pines yielded *Ceratostomella obscura* [ibid., xiv, p. 729], *C. pini* [ibid., xiv, p. 68 *et passim*], *C. exigua* Hedgc. (*Rep. Mo. bot. Gdn*, xvii, pp. 59–114, 1906), *C. multiannulata* [*R.A.M.*, xiv, p. 729], *C. pluriannulata*, *E. coerulescens*, *Pullularia pullulans* [ibid., xviii, p. 774], *Cadophora* spp., including *C. brunnescens* and *C. repens* [ibid., xiv, p. 729], and *C. rigidum* (unimportant on pines). The newly reported

D. sp. was absent from eastern Georgia, but otherwise there were no apparent geographical restrictions on the distribution of the staining fungi within the States embraced in the survey (which extended in part to Alabama and Florida).

D. natalensis was found to be most active during the hot summer months, though present to some degree as late as November; as its incidence fell, that of *Ceratostomella pilifera* rose, though in certain localities the latter organism was also prevalent in warm weather. *E. coerulescens* tended to undergo a diminution of vigour during the summer, but on the whole predominated, among the major hardwood-staining fungi, throughout the greater part of the year. There was a rough correlation between the seasonal fluctuations of the fungi under observation and the temperature relations for their growth. The frequency of *C. ips* is probably determined in a large measure by the distribution of the *Ips* beetles with which it is associated. Among the other fungi investigated the seasonal changes were not of great significance. The depressing influence of high temperatures on fruiting is thought to account for the falling-off of certain species during hot weather, while the virtual disappearance of *D. natalensis* throughout the cooler months may be attributable to the cessation of the production of inoculum on such common hosts of the fungus as cotton and sweet potato.

Report of Committee 17—wood preservation. Appendix D (4). Effect of preservative treatment by the use of creosote-petroleum, and zinc chloride and petroleum.—*Proc. Amer. Rly Engng Ass.*, xl, pp. 493–505, 1939.

Tables are presented showing the performance to date (January 1939) of about 1,000,000 hardwood and conifer sleepers in test tracks of the Northern Pacific, Reading, and Atchison, Topeka, and Santa Fé Railways treated with creosote-petroleum mixture (222,000), zinc chloride-petroleum (15,000), zinc chloride, creosote, and petroleum (16,000), and creosote alone (790,000), the last-named mostly at 5 lb. per cu. ft., the remainder at 7 lb. In the creosote- and creosote-petroleum-treated material (some of which had been on the tracks since the early years of the century), less than 5 per cent. of the failures were primarily due to decay, whereas about 65 per cent. of the failures in sleepers impregnated with zinc chloride resulted from this cause.

Robertson (W. A.). **Report of the Director of Forest Products Research for the year 1938.**—*Rep. For. Prod. Res. Bd, Lond., 1938,* pp. 3–84, 4 pl., 3 figs., 9 graphs, 1939.

The following are among the items of interest in this report [cf. *R.A.M.*, xviii, p. 75] apart from those already noticed from other sources. A new wood preservative (British Patent Application 3554/38, controlled by the Department of Scientific and Industrial Research) has been evolved [ibid., xviii, p. 830], the toxic constituent of which is mercuric chloride, a substance more toxic to wood-destroying fungi than any other inorganic compound commonly used as a wood preservative. Corrosion of metals by this preservative was so much reduced by the addition of sodium sulphite or sodium nitrite that the solution could

be used in ordinary steel equipment. As the mixture can be used at weak concentrations, its cost compares advantageously with that of other wood-preserving solutions.

Experimental evidence showed that wood-destroying fungi inducing brown rot, i.e., those attacking cellulose and carbohydrates only, cause the nutritive medium in which they are grown to become and remain extremely acid, whereas fungi producing white rot induce a temporary acidity, after which the P_H value of the medium returns to about its original figure.

The effect of the presence of rusting iron on the rate of decomposition of wood by fungi was ascertained to be a reduction in the amount of fungal decay, small amounts of soluble iron salts exercising a toxic effect on the fungi.

Trouble sometimes arises in the kiln-drying of oak from a yellow mould that grows over the boards. This is caused by a fungus of the *Penicillium divaricatum* group (syn. *Paecilomyces varioti* [ibid., xvii, p. 364] and *Eidamia catenulata* [ibid., xvi, p. 4]). Growing at temperatures up to 44°C., this fungus finds excellent conditions for its development in the early stages of the kiln-drying of oak planks. The development of the mould can, however, be checked by dipping the planks in a solution of one of the proprietary anti-stain substances of the chlorinated phenol type, though it was ascertained that mould growth was not completely inhibited by dipping in solutions containing up to 1·25 per cent. of the antiseptic. The superficial mould growth which may occur in a kiln on undipped planks may be checked by spraying the pile of timber with formaldehyde solution; this, however, involves using a respirator and does not prevent internal staining. A better method is to dip the planks in the antiseptic solutions immediately they have been sawn.

Data are tabulated showing that the extent to which timber has been decayed by fungi exerts a remarkable influence on the rate of development of the death-watch beetle (*Xestobium rufovillosum*).

During 1938 a number of inquiries were received concerning 'dote' or incipient decay caused in Douglas fir by *Trametes serialis* [ibid., xviii, p. 76]; the condition develops only under unsuitable storage conditions.

Ohl (F.). **Konservierungsmittel für die Papier-, Karton- und Pappenindustrie.** [Preservatives for the paper, carton, and cardboard industry.]—*Wbl. Papierfabr.*, lxx, 41, pp. 839–841, 1939.

After showing that none of the many commercial paper and cardboard preservatives on the German market is universally applicable, the writer discusses a number of such preparations and emphasizes the different points to be considered in making a selection for specific purposes.

Chlorothymol is soluble in water in the ratio of 3 : 10,000, and is mostly used as a solution with sodium lye or in alcohol. Its phenol coefficients are remarkably high, namely, 110 and 343 in soap and aqueous solutions, respectively. This compound and chlorisothymol (the latter a trade product supplied in the 'pure' and lye forms) may be utilized for a variety of objects. Chloro-cresol and -phenol salts are

also widely used, generally under registered trade names. 'Raschit', for instance, a colourless crystalline substance, represents para-chlorometacresol, the sodium salt of which is known as 'Raschit W'. Another cresol compound, the complex para-chlorometacresol-alkali, is a yellowish-white powder known as 'grotan'. The various 'preventols' used in paper and cardboard factories are also cresol and phenol products. Other paper preservatives include 'amicrol', 'solbrol', toluolsulphochloramide salts, halogen alkyl-phenols, chloroxylenol, hexylresorcin, 'nipagin' (the methyl ester of para-oxybenzoic acid) [*R.A.M.*, xii, p. 524], and ortho-phenylphenolsodium (sodium ortho-oxydiphenyl); the three last-named are of special interest, hexylresorcin and 'nipagin' on account of their absence of odour and non-toxicity to man, and ortho-phenylphenolsodium by reason of its extremely powerful disinfectant action (20 times higher than that of phenol), enabling it to be used at the low concentration of 0·5 to 1 per cent. of the dry weight of the material to be preserved, while even $\frac{1}{16}$ per cent. is reported by certain glue manufacturers to afford adequate protection. Parachlorometacresol should be used at an average rate of 0·05 per cent. for plant glues, e.g., starch products, and at 0·2 to 0·25 per cent. for those of animal origin and casein emulsions. The usual rate of application for para-chlorometacresol-alkali is 0·05 to 0·2 per cent. of the dry weight of the material to be preserved, costing about 0·3 to 1 pfennig per kg.

A number of well-known disinfectants are unsuitable for use as factory preservatives, some on account of their poisonous properties, and others because of their liability to injure the goods thus treated. A case is cited in this connexion of the discoloration of dyed rayon hose packed in cartons prepared with formaldehyde.

The author draws attention to the importance of determining the particular fungi and bacteria to be combated in specific instances, so that manufacturers of disinfectants may supply the preparations best adapted for the purpose required.

BOTTOMLEY (A[VERIL] M.). **Intensive Mushroom-growing for the amateur.**—*Bull. Dep. Agric. S. Afr.* 210, pp. 5–32, 12 figs., 1939. 6d.

The author gives a semi-popular account of the cultivation, marketing, pest and disease control, and cooking of mushrooms (*Psalliota* spp.) in South Africa. The information on fungal diseases of the crop has already been noticed from another source [*R.A.M.*, xix, p. 190].

MAYER (K.). **Die Kräuselkrankheit der Futter- und Zuckerrüben.** [Crinkle disease of Fodder and Sugar Beets.]—*Dtsch. Zuckerindustr.*, lxv, 1, pp. 53–56, 1 fig., 3 graphs, 1940.

This is a survey of the available information on fodder and sugar beet crinkle in Germany [*R.A.M.*, xviii, p. 107] with special reference to the life-history of the insect vector, *Piesma quadratum*, the relationship of environmental conditions to its activities in the spread of infection, and its control by means of traps. Near relatives of *P. quadratum* infesting both beets and wild Chenopodiaceae (the latter being preferred) are *P. maculatum* and *P. capitatum* and its vars. *brachypterum* and *macropterum*.

GREIS (H.). **Macrosporium cladosporioides, ein Erreger des Wurzelbrandes an der Zuckerrübe.** [*Macrosporium cladosporioides*, an agent of root rot of Sugar Beet.]—*Phytopath. Z.*, xii, 4, pp. 360–365, 2 figs., 2 graphs, 1939.

Macrosporium cladosporioides, hitherto known only as a saprophyte of beets, was observed in 1938 at the Kleinwanzleben (Germany) Research Institute, to be the joint agent, with *Pythium de Baryanum* and *Alternaria tenuis* [*R.A.M.*, xvii, pp. 368, 428] of a typical damping-off of sugar beets, involving the blackening and collapse of the young seedlings, the hypocotyledons of which were permeated and enveloped by a black mycelium.

M. cladosporioides produces two distinct types of conidia, one broadly ovate, with two to six transverse septa, occasionally uniseptate, and a few longitudinal, often only one, giving rise to confusion with *Cladosporium*, and the other clavate. The latter is frequently described as possessed of a smooth membrane, in contrast to the finely granular covering of the ovate conidia, but in the present observations some of the clavate conidia were definitely granular. The shape and size of the conidia are too variable to allow of the application of these characters for purposes of determination.

Positive results (up to 100 per cent. infection and collapse) were obtained in inoculation experiments in which sterilized seed-clusters were dipped in spore suspensions or painted with spores from pure cultures and subsequently maintained in a very damp atmosphere (80 to 90 per cent. relative humidity, or 50 to 70 per cent. for material allowed to germinate in the thermostat prior to planting out), either in Petri dishes at 20° C. or in dishes containing sterilized soil covered with bell-jars.

Good control was obtained by seed treatment with germisan or ceresan (short liquid process, 2 per cent. at 1·5 l. per 50 kg., or 30 minutes' immersion in 0·1 or 0·4 per cent., followed by six hours' covering), as well as by dusting with germisan at the rate of 350 gm. per 50 kg.

ROLAND (G.). **Essais de désinfection des graines de Betteraves, effectués en 1938.** [Disinfection experiments on Beet seed conducted in 1938.]—*Publ. Inst. belge Amélior. Better.*, vii, 5, pp. 543–547, 1939. [Dutch, German, and English summaries.]

In experiments conducted in 1938 at the Wageningen (Holland) Mycological Laboratory U.T. 685 dust (8 gm. per 1,000 gm. beet seed-clusters) and ceresan and germisan solutions (0·5 per cent.) were equally effective in the control of *Phoma betae* [*R.A.M.*, xix, p. 186], but the first-named has the advantage of greater facility of manipulation. The average increase in the incidence of germination as a result of the treatments was 40 per cent., the figures in both sterilized and unsterilized soils being comparable.

GOIDÀNICH (G.). **Il marciume dell' Insalata causato da 'Sclerotinia minoré' Jagg.** [The Lettuce rot caused by *Sclerotinia minor* Jagg.]—*Boll. Staz. Pat. veg. Roma*, N.S., xix, 3, pp. 293–334, 2 pl., 13 figs., 1 graph, 1939.

Early in 1939 lettuces and endives growing in the vicinity of Rome

were killed off in large numbers when approaching commercial maturity by a rot due to *Sclerotinia minor* [*R.A.M.*, xvii, p. 433], not previously recorded on lettuce in Italy. In culture, the fungus formed irregularly round, erumpent, black sclerotia, 660 to 1050 μ in diameter. Microconidia, 3 to 3·6 μ in diameter and with a large central vacuole, were produced at the extremities of the hyphae or on short lateral branches. No apothecia were observed in nature or in culture, and from its morphological and cultural characters [which are fully described] the organism would appear to belong to Chivers's strain 1 [cf. ibid., viii, p. 607]. The optimum, minimum, and maximum growth temperatures were, respectively, about 22°, 3° to 5°, and about 35° C., while the fungus survived freezing and temperatures of over 35°. Experimental inoculations of healthy, wounded and unwounded cos lettuce, cabbage lettuce, wild and cultivated endive, and sunflower gave characteristic rotting, death supervening in a few days. Control is recommended by soil sterilization.

[A condensed account of this work appears in *R.C. Accad. Italia*, Ser. VII, i, 1, pp. 70–73, 1939.]

Service and regulatory announcements July–September, 1939.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 140, pp. 115–117, 1939.

Summaries are given of recent revisions of the plant quarantine import restrictions prevailing in Cuba, Jamaica, Sierra Leone, Mexico, the Argentine, Turkey, Bermuda, Italy, Australia, Colombia, Kenya, and Paraguay.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiv, 1, pp. 7, 11, 1940.

Germany. A Notification of 14th August, 1939, admits the following exceptions to the Decree of 8th October, 1937, relative to the control of potato wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xvii, p. 551]. The non-resistant Erstling [Duke of York] may still be grown in 1941 in recognized centres for the production of very early crops, provided that the area covered by this variety does not exceed 35 per cent. of the total allotted for early potato cultivation, the remainder to be assigned to resistant sorts such as Primula, Frühmölle, Frühbote, Früheste Delikatess, or Sieglinde.

Mauritius. Proclamation No. 21 of 24th August, 1939, having declared all citrus trees growing on the Island of Rodrigues to be infected by *Pseudomonas citri*, the Director of Agriculture or any deputy authorized by him may at any time inspect the citrus-growing areas and order the destruction, removal, or other treatment of diseased or suspected plants.

Service and regulatory announcements July–September, 1939. Announcements relating to Woodgate rust quarantine (No. 65).—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 140, pp. 111–112, 1939.

Notice is given of the revocation, effective as from 31st July, 1939, of the Woodgate rust [*Peridermium* sp.] quarantine, imposed in 1928, which prohibited the inter-State shipping of Scots pine [*Pinus sylvestris*] and other hard species from a regulated area in the north of New York State [*R.A.M.*, viii, p. 272].

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PANASSYUK (M. P.). Основные выводы научно-исследовательских работ ВНИС за 1937 год. [Main results of the scientific research work during 1937 of the Pan-Soviet Scientific Research Institute for the Sugar Industry (VNIS).]—483 pp., 30 figs., 31 diags., 14 graphs, Пищепромиздат [Publ. Off. Food Industry], Leningrad, 1939.

This is a collection of papers arranged on the same lines as in the previous year [*R.A.M.*, xvii, p. 367].

Mme N. I. SALUNSKAYA (pp. 253–255) states that 1 per cent. emulsion of copper naphthenate (containing 1 per cent. copper) reduced infection by *Cercospora* [*beticola*: ibid., xviii, p. 647] in sugar beet by 21 per cent. as compared with reductions of 36·4 and 36 per cent. obtained with Bordeaux mixture and copper-lime dust, respectively. Observations and experiments showed that mass infection by *C. beticola* occurs when the air humidity does not fall below 85 per cent. during the night and 55 per cent. during the day for at least two to three days, and when the minimum temperature does not fall below 12° C. Both Bordeaux mixture and copper-lime dust gave larger increases in yield and greater reductions in infection with *C. beticola*, when applied on days when the above-mentioned conditions prevail, than at fixed intervals of 15 days.

V. P. MURAVYEFF, Z. A. POZHAR, and K. I. VITAS (pp. 255–257) studied the effect of vernalization of sugar beet seeds (e.g., by exposure to 100 per cent. humidity for two days at 25° C.) on the incidence of root disease [ibid., xvi, p. 790]. All methods of vernalization were found to increase the incidence of *Fusarium* sp. (57 to 100 per cent. as against 22 per cent. in the control) and of bacteria (38 to 100 per cent. as against 22), and to decrease that of *Mucor* sp. (0 to 20 per cent. compared with 100) and of dark moulds [unspecified] (11 to 75 per cent. as against 95). Soaking had a similar but slightly weaker effect on the incidence of micro-organisms in the seedlings. Long periods of vernalization resulted in up to 82 per cent. root rot infection in the field. Seed disinfection combined with vernalization and soaking in all cases reduced the amount of infection, the best results being obtained with germisan and the preparation AB. A comparison of seedlings raised from untreated and vernalized seeds showed in 23 out of 25 sets of experiments that the latter gave a high percentage of germination with a larger proportion of healthy seedlings, and a greater average weight of seedlings than the former.

S. F. Morotchkovski and K. I. Vitas (pp. 257–260) found that strains of *Botrytis cinerea* isolated from sugar beet, the soil, geranium [*Pelargonium*], rose, lemon, *Primula*, and *Chrysanthemum* were all equally capable of causing storage rot of sugar beet [ibid., xvii, p. 368]. Of other fungi involved in storage rot, *Rhizopus* sp. and *F. culmorum* were as virulent as *B. cinerea*.

Mme N. I. Salunskaya, N. I. Gomolyako, K. I. Vitas, and D. N. Greenberg (pp. 260–262) sum up the results of laboratory and field experiments on the *Rhizoctonia* disease of sugar beet as follows. Soil disinfection with formalin, applied at the rate of 700 l. per hect., reduced the infection by half. The crops grown in rotation with sugar beet are susceptible to *R.* in the following descending order: sugar beet, carrots, clover, lucerne, white clover, and potato, while sainfoin [*Onobrychis sativa*] is not attacked at all. The roots of sugar beet perish mostly during periods of dry and hot weather, preceded by a spell of high temperatures (with a minimum of not below 10°) and fairly abundant rains. The sugar content of roots attacked by *R.* was 2·4 per cent. lower than that of healthy ones, but their weight was the same. The growth of the fungus was best at temperatures of 20° to 30° and retarded at 2° to 6°. The conidial stage, *Tuberculina* sp. [? the *Tuberculina* stage of *Helicobasidium purpureum*: ibid., vi, p. 756; xix, p. 251], was observed for the first time in 1937, characterized by a soft, snow-white aerial mycelium, bearing yellowish-white cushions of conidiophores which later turn brownish-violet with unicellular conidia, 12·5 by 12·5 μ.

Croxall (H. E.) & Ogilvie (L.). **The incorporation of growth hormones in seed dressings.**—*J. Pomol.*, xvii, 4, pp. 362–384, 1940.

In a study on the effect of growth-promoting substances [cf. *R.A.M.*, xix, p. 206] such as α-naphthalene-acetic acid, mixed naphthylidene-acetic acids, and β-indolyl-butyric acid on seed germination and plant growth, dry dressings, comprising a proprietary mercurial and cuprous oxide as bases, with from 5 to 20 parts per million of these hormones were applied to seeds of seven varieties of peas and two of dwarf beans [*Phaseolus vulgaris*]. In the laboratory no improvement in germination was obtained by the application of these dressings. The germination of the pea variety Eclipse was reduced by treatment with cuprous oxide and this injury was not overcome by the incorporation of the hormones in the dressing. Seeds of five varieties sown in sterile soil in the greenhouse and treated with talc, cuprous oxide, and mercurial dressings, all containing hormones, showed an average of 100 to 113 in the rate of emergence as compared with 100 in the untreated control and an average of dry weight of seedlings three weeks after emergence of 110 to 149 as compared with 100 in the untreated control. The mercurial and cuprous oxide dressings used without hormones had a retarding effect on emergence under conditions of high temperature, and cuprous oxide had the same effect on the variety Eclipse when the soil moisture was below 20 per cent. saturation, but the rate of emergence was raised to about the level of the untreated control by the incorporation of the hormones in these dressings. Grown in soil contaminated with damping-off fungi (particularly *Pythium* spp.) seeds of

the pea variety The Lincoln treated with dressings containing hormones showed 62 to 82 per cent. emergence as compared with 24 per cent. in the untreated control and 52 per cent. in seeds receiving the mercurial dressing without hormones. Similar results were obtained with other varieties of peas and one of dwarf beans. In field trials during summer the crop yields obtained from seeds of varieties Foremost, Surprise, and The Lincoln treated with dressings containing hormones were greater by up to 80 per cent. than those obtained with the same dressings without hormones and in each case greater than from untreated seeds. The effect of dressings containing hormones varied considerably with the different varieties and dissimilar external conditions. No single concentration of either of the hormones tested gave a maximum stimulation at all stages of growth, to all varieties, and under all conditions, but it appears that dressings containing 5 p.p.m. of α-naphthalene-acetic acid and mixed naphthylidene-acetic acids may safely be applied to the pea and bean varieties used in these tests.

Glasscock (H. H.) & Wain (R. L.). **Distribution of manganese in the Pea seed in relation to marsh spot.**—*J. agric. Sci.*, xxx, 1, pp. 132–140, 1 fig., 1940.

Recent investigations having demonstrated the importance of manganese deficiency in the soil in the etiology of marsh spot of peas [*R.A.M.*, xix, p. 187], the writers carried out analyses at the South-Eastern Agricultural College, Wye, Kent, to determine the distribution of the element in diseased seeds of the Harrison's Glory variety from the most severely affected of the 743 samples of seed examined in the 1933–4 survey of Romney Marsh soils by Furneaux and Glasscock [ibid., xv, p. 626]. The methods of analysis used were those described by M. B. Richards (*Analyst*, lv, p. 554, 1930) and Wain (*J.S.-E. agric. Coll. Wye*, xlii, p. 146, 1938). No loss of manganese resulting from the preliminary immersion of the seeds for 24 hours in distilled water, soaked peas were used for dissection in preference to dry ones.

The minimum manganese content in diseased peas was found in the peripheral cotyledonary tissues (5 p.p.m.), followed by the germ (3) and seed coat (2), whereas in a healthy sample used for comparison not only were the values much higher but their distribution was different, ranging from 15 p.p.m. in the germ to 4 in the seed coat, with intermediate quantities in the cotyledon (11 and 6, respectively, in the outer and inner tissues).

A given weight of small peas of the diseased sample was found to contain less manganese than the corresponding weight of large ones (average of six determinations 3·4 and 4·1 p.p.m., respectively), whereas in the healthy material the relationship between size and manganese content was reversed (average of seven determinations, 8·7 large, 9·3 small). These discrepancies in the manganese contents of different size groups suggest the advisability of selecting peas of uniform dimensions for analytical purposes.

The low manganese value of peas suffering from marsh spot in comparison with that of healthy ones is tentatively attributed to the migration of the cell contents from necrotic pockets in the

starch-containing cotyledonary tissues, where the bulk of the element normally resides.

Loos (C. A.). **A blight of Carrot leaves.**—*Trop. Agriculturist*, xciii, 6, pp. 343–345, 1 pl., 1939.

The carrot disease caused by *Macrosporium carotae* [*R.A.M.*, xviii, p. 444] is recorded for the first time from Ceylon. It was observed in 1939 in a garden at St. Coombs, where a whole bed was wilted within three weeks, most of the leaves being dead. It is thought probable that the exceptionally wet conditions of that season had favoured the development of the disease. No control measures were attempted other than the uprooting of the bed. Spraying is only considered necessary in Ceylon in very wet weather.

Jones (H. A.), Porter (D. R.), & Leach (L. D.). **Breeding for resistance to Onion downy mildew caused by Peronospora destructor.**—*Hilgardia*, xii, 9, pp. 531–550, 6 figs., 1939.

Onion downy mildew (*Peronospora destructor*) [*P. schleideniana*: *R.A.M.*, xvii, p. 647; xviii, p. 778] frequently attains epidemic proportions in California, where the losses sustained by seed-growers range from 0 to 80 per cent., weather conditions being the chief controlling factor. During the past 19 years the annual reduction in seed yield due to infection has been 10 per cent. or more in six seasons, with a maximum of between 60 and 80 per cent. in 1925, and several annual losses of over 40 per cent.

Practical difficulties exist in the control of downy mildew, especially the poor wetting qualities of the waxy surface of onion leaves and stalks, and the necessity of frequent spray applications which are almost impossible to carry out when required since the soil is frequently too wet. These difficulties make the development of resistant varieties very desirable. In work on these lines a number of onion varieties were tested and three sources of resistance have been found. The most promising is strain 13–53, a male-sterile selection from the Italian Red variety; the seedstalks are immune, and the foliage is highly resistant. Another strain of Italian Red, 13–20–3, also shows seedstalk immunity, though the foliage is only slightly resistant. In type, 13–20–3 is superior to 13–53. Seedstalk immunity was also found in 1934 in an F_1 hybrid between Red 21 and two inbred lines of Stockton Yellow Flat, viz., 50–6 and 50–6–1. Some F_3 and back-cross populations with 13–53 as the resistant parent are very promising. No infection was observed on garlic.

Jagger (I. C.). **Brown blight of Lettuce.**—*Phytopathology*, xxx, 1, pp. 53–64, 5 figs., 1940.

This is a preliminary report, found among the late author's papers, on his investigations of brown blight of lettuce in the Imperial Valley of California from 1922 to 1927 [*R.A.M.*, viii, p. 286]. In addition to information already presented, it has been found that the disease is soil-borne, the incidence increasing from 1 per cent. in the first to 75 and upwards in the third or fourth crop. A root parasite is suspected as the agent of the disturbance, an hypothesis borne out by

the results of soil sterilization experiments, in which complete control was effected by one hour's steaming at 10 to 15 lb. pressure and by drenching with 1 in 20 formaldehyde. The nature of the pathogen is still obscure. *Asterocystis radicis* [*Olpidium brassicae*: ibid., xviii, p. 821] is commonly present in the epidermal cells and root hairs of diseased plants, but the striking similarity of the disease to the soil-borne wheat mosaic suggests a virus agent. Attempts at the transmission of the symptoms by means of grafting and insects, however, have been unsuccessful. Through selection from the very susceptible, widely grown New York variety a highly resistant strain has been secured which is coming into commercial use under the name of Imperial No. 2.

Mémento [du Service de la] Défense des Végétaux [Maroc]. [Memoranda of the Plant Protection Service of Morocco.]—20, 21, 24, 27 pp., 6 pl., 1939.

Nos. 20, 21, and 24 of this series of semi-popular leaflets, deal, respectively, with shot hole (*Clasterosporium carpophilum*) of stone fruits, apple and pear scab (*Venturia inaequalis* and *V. pirina*) [cf. *R.A.M.*, xvi, p. 389], and vine powdery mildew (*Uncinula spiralis*) [*U. necator*] in French Morocco. Against the last named, growers are advised to mix lime or gypsum with the sulphur dust in the ratio of 1 : 2 from the second treatment onwards (in case of very hot weather 1 : 1 for the third application and following) in order to avoid scorching. Colloidal sulphur has been found in Algeria to be more effective than the dust in overcast and rainy weather during April and May, but after this period, when the temperature rises above 20° C., the dry product is preferable. Potassium permanganate [ibid., xvi, p. 795] is an excellent fungicide but exerts no prophylactic effect.

Osterwalder (A.). **Vom Inkubationskalender der Peronospora.** [On the *Peronospora* incubation calendar.]—*Schweiz. Z. Obst- u. Weinb.*, xlviii, 26, pp. 519–522, 1939; xlix, 1, pp. 3–9, 2 graphs, 1940.

This is a critical evaluation, based on the results of regional observations in Switzerland and a perusal of the pertinent records from other countries, of the practical utility of K. Müller's incubation calendar for the prediction of outbreaks of vine downy mildew (*Peronospora*) [*Plasmopara viticola*] with a view to the timely application of control measures [*R.A.M.*, x, p. 432]. The conclusion reached is that the method is reliable only in districts with a relatively dry climate, the rapid succession of secondary infections in localities subject to heavy precipitation precluding accurate forecasts of the critical dates for spraying.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 2, pp. 79–82, 4 figs., 1940.

Scattered barberry plants may still be found in the cooler parts of New South Wales, though it is incumbent on their owners to see that they are eradicated. Numerous hedges and plants of *Berberis aristata* occur in the Bowral-Bundanoon district, and inoculation tests by Dr. W. L. Waterhouse showed this species to be resistant to wheat rust [*Puccinia graminis*].

French beans [*Phaseolus vulgaris*] in coastal areas are commonly affected in late summer and autumn by angular leaf spot (*Isariopsis griseola*) [*R.A.M.*, xvi, p. 564]. Young plants are not usually affected, and the fungus, which appears to be a relatively weak parasite, under normal conditions only attacks the older leaves. The control measures suggested consist in a three or four years' rotation and the destruction of diseased plants at the end of every season by burning or deep ploughing.

Citrus brown rot (*Phytophthora hibernalis*) [ibid., xvii, p. 313] is not generally important in New South Wales, but causes heavy loss in some localities, particularly in the Windsor and Wingham areas, which are subject to flooding, and in low-lying parts of the Gosford-Wyong districts which are either flooded periodically or are kept damp by seepage. The heaviest losses occur in seasons in which heavy rainfall is experienced in autumn and winter. The control methods advised include pruning away the lower branches and spraying thoroughly with Bordeaux mixture-oil (4–4–80–½) in early April, before or immediately after the first heavy autumn rains.

To prevent stickiness in the compost used for the growing of mushrooms [*Psalliota* spp.] the incorporation of gypsum and superphosphate is advised [ibid., xviii, p. 230].

MARTYN (E. B.). **Report on the Botanical and Mycological Division for the year 1938.**—*Div. Rep. Dep. Agric. Brit. Guiana, 1938*, pp. 81–82, 1940.

This report on plant disease work in British Guiana [cf. *R.A.M.*, xvii, p. 298] contains the following items of interest. Abnormally wet weather, with no 'spring' dry season, in 1938 favoured the development of banana leaf spot (*Cercospora*) [*musae*: ibid., xvi, p. 156]. The abnormal weather was also probably chiefly responsible for an exceptionally severe infection of coffee by *Sclerotium coffeicola* [ibid., xiv, p. 184], which became very noticeable in younger plantations on the Barima and Aruka rivers in September. Frog eye (*C. nicotianae*) and mosaic were prevalent on tobacco. Several bad attacks of tomato mosaic occurred in February, and Sinebone beans (*Phaseolus vulgaris* var.) were also affected by mosaic, both these diseases appearing to be aggravated by wet weather.

Botany and plant pathology section.—*Rep. Ia agric. Exp. Sta., 1938–39*, Part I, pp. 99–124, 2 figs., 1939.

This report on plant disease work in Iowa in 1938–9 [*R.A.M.*, xviii, p. 157] contains, *inter alia*, the following items of interest. Further studies by S. G. Younkin and I. E. Melhus on failures in watermelon seedlings showed that species of *Pythium*, *Rhizoctonia*, and *Fusarium* were constantly associated with damping-off [ibid., xviii, p. 84]. Isolations from plantings made at weekly intervals from 13th April to 30th May showed that *F.* spp. were largely associated with damping-off in the first planting, while *P.* spp. predominated in all subsequent plantings up to 15th May, and thereafter most of the isolates were a species of *R.* Approximately 50 per cent. of the *P.* isolates belonged to *P. irregulare* [loc. cit.], the remaining 50 per cent. belonging to another

morphological group; both groups were pathogenic to watermelon seedlings. *Pythium* was found in the infected tissues of watermelon varieties with light rinds showing blossom-end rot. Of the two isolates obtained in pure culture, one appeared to resemble morphologically the unidentified group of *Pythium* isolates from watermelon seedlings, while the other belonged to a different species. Both isolates were pathogenic to mature and immature watermelon fruits.

H. C. Murphy found that the yield and bushel weight of oats showed a high negative correlation with the amount of crown rust [*Puccinia coronata*] present. As lodging increased with increased yield and increased infection (together or singly), the effect of lodging on yield and that of infection on lodging tended to be nullified. In 20-acre plots at Ames, for every increase of 1 in the coefficient of crown rust there was an average decrease in yield of 0·3053 bush. per acre, so that, in theory, a crown rust coefficient of 100 would give an average decrease in yield of 30·5 bush. per acre. On a similar basis, a 100 coefficient of crown rust would have given decreases of 32·1 and 27 bush. per acre in the nurseries at Ames and Kanawha, respectively. Early maturity was highly beneficial to the susceptible standard varieties, allowing them to escape considerable rust injury. The early resistant selections benefited much less, and as resistance increased the benefit to yield derived from early maturity decreased.

H. C. Murphy and L. C. Burnett state that three new oat varieties, Boone, Marion, and Hancock, adequately resistant to the races of stem rust [*P. graminis*] and smut [*Ustilago avenae* and *U. kolleri*] endemic in the maize belt, are to be distributed to farmers in 1940. Boone (C.I. No. 3305) is a selection from a cross of Victoria × Richland, while Marion and Hancock (C.I. Nos. 3247 and 3346, respectively) are selections from a cross of Markton × Rainbow.

E. L. Waldee states that leaf spot of sugar beet (*Cercospora beticola*) occurred in 1938 in an epidemic form later than usual, and appeared to have a pronounced effect on the amount of sucrose in the roots, no field tested averaging over 14·5 per cent. sugar, though in 1937 some beet crops averaged 16·5 per cent. sugar. Leaf spot generally develops in Iowa between 15th July and 15th August, subsiding when the nights become cooler. From the latter date to 15th October, the weather is generally unfavourable to *C. beticola* but favourable to the beets. As a rule, therefore, the beets largely escape infection after the middle of August and develop normal foliage. The severe late infection in 1938 resulted from exceptionally hot weather towards the end of the season, and was the chief cause of low sugar percentages. Of 20 sugar beet varieties planted in a heavily infected plot, American No. 1936, CLR, and American No. 5 maintained a leaf surface in spite of severe leaf spot.

In tests by I. E. Melhus sweet potato slips treated with P.D.7 (1 in 3·5), semesan bel (1 in 10), and cuprocide 54 (1 in 25) against stem rot [*Fusarium oxysporum* f. 2 and *F. bulbigenum* var. *batatas*: ibid., xix, p. 192] gave, respectively, 77·8, 84·1, and 87·3 per cent. surviving slips and yields of 210, 183·4, and 179·2 bush. per acre, the corresponding figures for the untreated controls being 64·1 per cent. and 156·8 bush. Experimental evidence was obtained that sweet potato slips planted early developed less stem rot than those planted late.

G. Semeniuk and I. E. Melhus state that 85 individual heads of onion seeds obtained from 11 selected inbred lines of Red Globe onion bulbs allowed to cross-pollinate were planted in soil infected with pink root rot (*Phoma terrestris* and *F.* [*vasinfectum* var.] *zonatum* [f. 1]) [ibid., xvii, p. 7], commercial Red Globe seed also being planted for comparison. Four of the 85 lines were as susceptible to infection as the commercial seed, which gave over 75 per cent. rot, but two were of outstanding resistance, and one was moderately resistant.

In greenhouse and field tests by I. E. Melhus, C. S. Reddy, W. F. Buchholtz, and H. C. Murphy, *Pythium graminicolum* and *P. de Baryanum* caused stunting of maize seedlings and prevented seed germination. Seedling stands in soil infected with *P. graminicolum* were lower than stands from seed planted in steamed, uninfected soils. Plants with roots infected by *P. graminicolum* were stunted, and the leaf tips were yellow and blighted; in severe cases the leaves were rolled and drooped. Affected plants gradually wilted and dried up. The principal effect of *P. de Baryanum* was reduction in germination. Of 178 isolates from necrotic lesions on the roots of field-grown oats in 1938, 107 were species of *Pythium*, 60 *Fusarium*, 4 *Rhizoctonia*, and 7 *Helminthosporium*. All of 32 varieties of oats grown in steamed soil infected with *P. de Baryanum* and *P. irregulare* showed typical root lesions. The most resistant varieties were Flughafer, Landhafer, and Columbia. Pre-emergence killing and post-emergence injury were greatest at 10° to 20° C.; at 25° to 30° plants in infected soil had few lesions and were almost as vigorous as the controls in uninfected soil. Evidence obtained indicated that lowering soil temperatures below 15° and liming inhibit lucerne damping-off due to *P. de Baryanum*.

I. E. Melhus, C. S. Reddy, W. F. Buchholtz, and E. L. Waldee state that severe root rot of sugar beets was caused by *Aphanomyces cochlioides* [ibid., xvii, p. 428].

I. E. Melhus observed that *Phomopsis juniperovora* caused severe infection on red cedars [? *Juniperus virginiana*: ibid., xviii, p. 444] and noted a leaf spot (probably caused by *Piggotia fraxini*) of green and white ash [*Fraxinus pennsylvanica* var. *lanceolata* and *F. americana*] in nurseries.

Agricultural research in Colorado. Fifty-first Annual Report Colorado Experiment Station 1937-38.—60 pp., 1938. [Received April, 1940.]

This report [cf. *R.A.M.*, xvii, p. 301] contains the following items of phytopathological interest besides information already noted from another source. *Phytophthora capsici*, the agent of chilli blight [loc. cit.], is parasitic on cucumber fruits in the field, but not on mature plants. Strains of the fungus from cucumber display a sexual reaction differing from that manifested by those isolated from dying chilli plants. Selections from field chillies have given evidence of resistance to the disease. Resistance to lettuce tipburn [ibid., xv, p. 559] has been shown by many good lines, seed samples of which have been sent to California for propagation.

The number of new cases of peach mosaic eradicated in 1937 was

3,517 as compared with 9,835 in the previous year. 'Indexing' of all plums in the Palisade area is now in progress, involving the grafting of healthy Elberta scions into the plum tree. Should the latter carry the virus, symptoms of the disease will be expressed on the peach growth, thereby assisting in identification and promoting effective control.

The *Fusarium* sp. responsible for carnation root rot [? *F. dianthi*: ibid., xiii, p. 151] has been observed, in the course of regular visits to Denver greenhouses, to occur in plants showing no external symptoms and to be transmissible through cuttings from such individuals.

Bitancourt (A. A.). **Brazil: diseases of cultivated or useful plants, observed in the State of São Paulo.**—*Int. Bull. Pl. Prot.*, xiv, 2, pp. 25–27, 1940.

This second list of diseases of economic and ornamental plants in São Paulo, Brazil [*R.A.M.*, xvii, p. 299], records, *inter alia*, *Sphaceloma arachidis* Bitancourt & Jenkins on groundnut, *Chloridium musae* on banana, *Sphaerulina maydis* on maize, *Elsinoe theae* Bitancourt & Jenkins on tea [see below, p. 369], *Leptothyrium pomi* [ibid., xix, p. 291] on vine, *Elsinoe pitangae* Bitancourt & Jenkins on *Eugenia pitanga*, and *Claviceps paspali* on *Paspalum plicatulum* and *P. proliferum*.

Hendrickx (F. L.). **Observations phytopathologiques à la station de Mulungu en 1938.** [Phytopathological observations at the station of Mulungu in 1938.]—*ex* Rapport annuel pour l'exercice 1938 (2e partie), *Publ. Inst. nat. Étud. agron. Congo Belge*, pp. 117–128, 1939. 25 fr.

In this report [cf. *R.A.M.*, xix, p. 72], the author states that during the period under review coffee roots at Mulungu were infected by *Fomes lignosus* and a species of *Rosellinia*, probably *R. arcuata*, although no fructifications were observed. *F. lignosus* causes important damage at Ngweshe, where it has been present for many years. Infection appeared to be associated with unfavourable soil conditions. Contrary to the prevalent opinion, the shade tree *Leucaena glauca* seemed resistant to attack by this fungus. In affected coffee plantations control should be undertaken by digging draining channels below the level of the impermeable soil surrounding the affected roots, or by liming the soil.

In coffee plantations in wet localities *Corticium salmonicolor* causes damage to the branches. The disease, however, is not important. At Kivu some leaf infection is caused by *Hemileia vastatrix*, and the teleutospores were found in October and November at Mulungu in old uredo lesions. The rust lesions sometimes show the presence of *Verticillium*, *Cladosporium*, *Macrosporium*, and *Fusarium* spp., and a small orange-coloured larva was observed feeding on the uredospores.

Cercospora coffeicola caused severe infection of the leaves of young *Coffea liberica* plants in a nursery at Mulungu. *Glomerella cingulata* also caused leaf infection of coffee, while other leaf spots were due to *Phyllosticta coffeicola*, *Mycosphaerella coffeicola*, and *Phaeosphaeria* sp.

Cephaleuros virescens was found on coffee, tea, *Cinchona*, and other plants.

By far the most serious parasite of coffee fruits at Mulungu is *G. cingulata*, the losses due to this fungus being most severe at altitudes over 2,000 m. In the vicinity of Ngweshe the losses in some plantations amount to 80 per cent. of the estimated crop. At lower altitudes attacks are less virulent, and fruit infection does not necessarily entail loss of the coffee beans. *Cercospora coffeicola*, besides attacking the leaves, also produces slight infection of the pericarp and fleshy mesocarp of the drupes. Serious losses were caused by peduncle rot associated with *G. cingulata* and a species of *Fusarium*.

A species of *Alternaria* was isolated from *Cinchona* seedlings with diseased rootlets grown in pots. A species of *Rosellinia*, found on seedlings of the same host, frequently caused the death of the plants when they were planted out. Trunk and branch infections, leading to wilting, were produced by *Corticium salmonicolor*. *Cinchona ledgeriana* and *C. succirubra* were affected by tracheomycosis, which rapidly proved fatal.

The only root disease of tea observed was due to *Rigidoporus microporus* [*Fomes lignosus*].

Other diseases observed included *Erysiphe polygoni* on potato, *Isariopsis griseola*, *Phytophthora phaseoli*, and *Ascochyta boltshauseri* [ibid., xvi, p. 655] on beans [*Phaseolus* spp.], *Uromyces sojae* and *Ascochyta sojaecola* on soy-bean, and *Puccinia endiviae* [ibid., xv, p. 775] on endive.

CARDOSO (J. G. A.). **Mozambique: fungi, bacteria and diseases of unknown origin observed in the Colony.**—*Int. Bull. Pl. Prot.*, xiv, 2, pp. 28–29, 1940.

The following are among the items of interest in this list of fungal, bacterial, and indeterminate diseases of cultivated plants in Mozambique: *Oospora citri-aurantii* and psorosis on orange, *Phyllosticta prunicola* [*R.A.M.*, xviii, p. 534] on peach, *Phyllactinia corylea* on mulberry and papaw, *Cercospora fusca* on pecan, *Melampsorella ricini* and *Cercosporina* [*Cercospora*] *ricinella* on *Ricinus communis*, *Hemileia vastatrix* and *C. coffeicola* on coffee, *Colletotrichum phomoides* and *Bacterium solanacearum* on tomato, leaf curl of tobacco, vine downy mildew (*Plasmopara viticola*), *Sorosporium reilianum* and *Diplodia zeae* on maize, *Ustilago hordei* on barley, *Cordana* [*Scolecotrichum*] *musae* on banana [ibid., xix, p. 158], *Cercospora personata* and rosette on groundnuts, and *Bact. malvacearum* on cotton.

FEDOTOVA (Mme T. I.) & KASPEROVICZ (Mme Z. S.). Ускоренный метод определения бактериальной зараженности семян с.-х. растений. [A quick method for determining the bacterial contamination of seeds of crop plants].—*Bull. Pl. Prot., Leningr.*, *1939*, 1, pp. 92–93, 1939.

A simple and quick serological method for the determination of seed contamination with various bacterial diseases which proved successful in tests with cotton, wheat, and beans [*Phaseolus vulgaris*] is described as follows. Sera immunized against bacteria known to parasitize the crop under analysis are first prepared; these sera can be stored for

many years without losing their properties. Next, seeds and pieces of plant tissue are placed in test-tubes with a liquid nutritive medium and incubated for several hours to promote bacterial growth; and finally this bacteria-containing liquid, which represents the antigen, is added to the immunized serum. A floccular bacterial precipitate will result if the pathogen against which the serum has been immunized is present. This type of analysis can be entrusted to comparatively untrained persons provided they are supplied with sera prepared in central laboratories, and is, therefore, recommended for wide practical use.

Castellani (E.). **Problemi fitopatologici dell' Impero. Osservazioni ed orientamenti.** [Phytopathological problems of the Empire. Observations and orientations.]—*Agricoltura colon.*, xxxiv, 1, pp. 5–15, 1940.

In this review of phytopathological problems in Italian East Africa the author states that the following [apart from those already noticed from other sources: *R.A.M.*, xviii, pp. 22, 95, 519; xix, pp. 8, 84] are among the chief diseases of native-grown crops: *Puccinia sorghi* [*P. maydis*], *Ustilago zeae*, and *Sorosporium reilianum* on maize, and *P. purpurea*, *Sphacelotheca sorghi*, *S. cruenta*, *Sorosporium reilianum*, and *Tolyposporium ehrenbergii* on sorghum.

Sibilia (C.). **Primi risultati dello studio di razze fisiologiche di Puccinia rubigo-vera tritici in Etiopia.** [First results of the study of physiologic races of *Puccinia rubigo-vera tritici* in Abyssinia.]—*Agricoltura colon.*, xxxiii, 12, pp. 656–659, 1939.

Notes are given on three new physiologic races of *Puccinia triticina* (provisionally designated E2, E3, and E4) isolated from wheat in Abyssinia since the new race L1 was found in Libya [*R.A.M.*, xviii, p. 507]. Race E2 (from native wheat at Ambò, altitude 2,300 m.) gave infection types 3, 1, 1, 4, 1, 0, and 2 on the Carina, Brevit, Webster, Loros, Mediterranean, Hussar, and Democrat varieties, respectively, the corresponding figures for E3 (from Duro Conti 40, at Amaresa, 1,940 m.) being 3, 3, 2, 2, 4, 1–2, and 4, and for E4 (from Riale, Amaresa), 2, 4, 0, 2, 4, 2, and 4. Race E4 differs from 25 only in that it produces type 2 infection on Hussar, and from 58 only in giving types 0 and 2 infection on Webster and Loros, respectively. All three races (as well as L1) failed to infect Malakoff and gave only weak infection on Carina, all four being, apparently, of intermediate virulence.

Fischer (G. J.), Santoro (R.), & Aznarez (M.). **Ensayos de germinación de Trigos sometidos a tratamientos anticriptogamicos.** [Germination experiments with Wheats subjected to fungicidal treatments.]—*Arch. fitotec. Uruguay*, iii, 1, pp. 69–85, 4 figs., 1 graph, 1938. [English and German summaries. Received April, 1940.]

A comprehensive, fully tabulated account is given of the writers' experiments from 1935 to 1937 at the 'La Estanzuela' National Plant

Breeding Institute, Montevideo, Uruguay, on the germinability of wheat seed-grain disinfected with various fungicides against bunt (*Tilletia*) [*caries* and *T. foetens*], and of additional tests by the first-named in the Argentine in 1937–8 on the effect on the same property of the hot-water treatment, with and without the supplementary use of antiseptics.

Copper sulphate, in the form of a ten-minute dip in a 1 per cent. solution, exerted a more or less adverse effect on the germination of all the samples of grain tested, as also did U.T. 2983. Copper carbonate (0·1 to 0·8 cu. mm. per seed) caused no injury, while two preparations of uspulun dust (one modern) were detrimental only at the maximum strength used.

In the experiments with hot water (47° to 48° C., 110 minutes' immersion), the Rafaela 6 variety sustained an appreciable loss of vigour and germinative capacity; Klein Acero, on the other hand, was greatly stimulated by the treatment, while C. Granadero was unaffected as regards germination, but produced a smaller number of robust plants than the control. In the series subjected to antiseptic treatments with and without previous soaking in hot water, the Litoral 1 variety withstood an excess of copper carbonate fairly well; uspulun, on the other hand, caused heavy damage at the maximum strength without removal of the superfluous dust. Granosan was harmful at a strength of 0·0001 gm. per seed and lethal at 2 mg., with or without removal of the excess dust.

LAROSE (E.) & VANDERWALLE (R.). **Nouvelles recherches sur le charbon du Froment.** [New researches on Wheat smut.]—*Bull. Inst. agron. Gembloux*, viii, 3–4, pp. 205–214, 2 figs., 1939. [Flemish, German, and English summaries.]

In further investigations into the resistance of wheat to loose smut (*Ustilago tritici*) [*R.A.M.*, xvi, p. 732] the authors selected the highly susceptible variety Vilmorin 27 as the female, emasculated the plants, and then immediately inoculated them with their own smut and at the same time fertilized them with pollen of the resistant variety Jubilé. In two subsequent experiments the same variety was similarly treated, but was fertilized three days and six days after inoculation, respectively. The seed from these plants gave rise to no smutted plants. At the same time similar experiments were made with Jubilé fertilized by Vilmorin 27 pollen and in this case too the resulting seed gave no infected plants. The results obtained when Vilmorin 27 was fertilized by pollen from Jubilé several days after inoculation, when mycelium was able to penetrate the ovarian tissues deeply, are thought to indicate that resistance is an embryonic character, and the authors express the view that the amount of mycelium developing in the embryo determines the amount of infection developing in the plant and ears.

Certain susceptible wheats were found to give a high percentage of partially infected plants and ears, a result which is attributed to resistance in the host resulting in sparseness of mycelium in the embryo. Evidence was obtained that loose smut can pass from one generation to the next by vegetative infection.

PETIT (A.). **Les principaux produits anticryptogamiques destinés au traitement des semences de Blé et d'Orge.** [The principal fungicidal products intended for the treatment of Wheat and Barley seed.]—*Ann. Serv. bot. Tunis*, xiv–xv (*1937–8*), pp. 53–84, 1939.

Comparative tests [the results of which are tabulated] carried out in Tunis with a large number of dusts for the control of *Tilletia levis* [*T. foetens*], *T. tritici* [*T. caries*], and *Urocystis tritici* on wheat and *Ustilago hordei* on barley demonstrated that complete control resulted from the use of cuprous chloride at the rate of 250 gm. per quintal for bunt and 350 gm. for barley smut. Anhydrous copper sulphate, copper arsenite, and copper oxychloride were somewhat less satisfactory. The addition of 50 per cent. of neutral or acid 'yellow' sulphur to copper salts gives mixtures which will control wheat bunt and barley smut if not more than 0·1 per cent. of spores (by weight) are present. Sulphur reduces the toxicity of cupric oxychloride and cupric chloride towards bunt, but increases it towards barley smut; it also increases the toxicity of quinolin towards bunt. When equal amounts of copper are present, products with a base of cupric chloride are by far the most effective. With copper oxychlorides and copper carbonates, the physical structure of the mixture has an important effect on fungicidal efficiency.

PETIT (A.). **Moyens individuels et collectifs de défense contre 'Ustilago tritici'.** [Individual and collective means of controlling *Ustilago tritici*.]—*Ann. Serv. bot. Tunis*, xiv–xv (*1937–8*), pp. 43–52, 1939.

In 1936 an epidemic outbreak of wheat loose smut (*Ustilago tritici*) occurred in Tunis and large-scale seed treatment became necessary in order to save the widely grown Florence×Aurore variety, the yield of which in 1938 amounted locally to 1,500,000 quintals. The chief control method adopted was the collective treatment of seed. Such treatment, in continuous operation, is more effective and economical than treatment by individual growers. It consists in two successive immersions in hot water, the first for 45 minutes at 45° C., and the second for 10 minutes at 52°. This method is equally applicable to hard and soft wheat and barley [against *U. hordei*]. Individual growers may use a slight modification of the collective method and immerse the seed for 50 to 60 minutes in water at 48° to 43° (average 45·5°), and then for 10 minutes in water at 52·5° to 51·5° (average 52°). Alternatively, dipping may be carried out once only, the duration being 1¼ to 1½ hours for soft wheat (for which this method is recommended), and 2 to 2½ for hard, the temperature of the water in either case ranging from 48° to 45·5° (average 46·7°).

In one experiment infection of *U. tritici* is stated to have been reduced from 9·6 per cent. in the controls to 2·8 per cent. by heavy dusting (350 gm. per quintal of seed) with 300-mesh white sulphur at an average temperature of 25°, followed by three exposures at intervals of one month to carbon disulphide vapour for 48 hours, the dosage used being 100 gm. per cu. m. of seed.

Oort (A. J. P.). **De verspreiding van de sporen van Tarwestuifbrand 'Ustilago tritici' door de lucht.** [The dissemination of the spores of Wheat loose smut (*Ustilago tritici*) through the air.]—*Tijdschr. PlZiekt.*, xlvi, 1, pp. 1–18, 1 pl., 2 diags., 1940. [English summary.]

A tabulated account is given of the writer's experiments at Sprundel (North Brabant) and Wageningen to determine the part played by aerial dissemination of the spores in the spread of loose smut of wheat (*Ustilago tritici*), the incidence of which in stands raised from seed from approved sources is stated to be frequently unreasonably high. The Sprundel field, 92 by 95 m., situated at a considerable distance from other wheat plantings, was sown in the autumn of 1936 with Juliana winter seed-grain disinfected by the hot-water treatment [*R.A.M.*, xvi, p. 444], with the exception of one plot 10 by 10 m. of heavily infected material designed to serve as inoculum. At an inspection in the following summer the stand grown from the diseased seed-grain showed about 1,350 smutted heads, the remainder of the field being entirely healthy. Samples taken in different directions and at varying distances from the focus of infection were sown separately and the numbers of smutted heads recorded. Part of the Wageningen field was already in use for several loose smut experiments and thus afforded a source of infection: disinfected Vilmorin 27 seed-grain was sown on strips of land on two sides of the field, and the same harvesting procedure followed as at Sprundel.

The resultant data from both tests showed that in all directions except the north-west the dissemination of the spores extended to the edge of the fields. At Sprundel, for instance, there were as many as 11 smutted heads per 100 sq. m. at a distance of 70 m. to the south-east, the corresponding figures for Wageningen at 50 to 90 m. being 1 to 3. A closer analysis of the Sprundel data showed that the spread of the spores in a south-easterly direction was very pronounced and that it diminished regularly with increasing distance from the source of inoculum; in other directions dissemination was weaker and erratic, so that smut islands alternated with disease-free patches. The flowering time of the wheat (with which spore dissemination coincides) lasted from 10th to 18th June, during the first few days of which the light to moderate winds blew from various directions; from the 15th onwards, however, there was a strong north-westerly wind. Strong winds involve horizontal dissemination at the height of the heads, with the result that infection is heavy and decreases with distance; light winds, on the other hand, are accompanied by vertical air currents causing the alternate rising and falling of the spores and producing the general weakness and irregularity of infection observed in the experimental area. Should it be proved that dissemination can take place over even longer distances (1 km. or more), the vertical air currents associated with light winds may assume greater importance than the strong horizontal movements; in the meantime, however, confirmation of the former hypothesis is lacking, while the significance of strong winds in the spread of loose smut has been fully established by the experiments described. Field inspections should be extended to cover adjacent areas for a distance of several hundred metres.

PISSAREFF (V. E.) & MALINOVSKAYA (Mme E. S.). Селекция яровой Пшеницы на устойчивость к фузариозу. [Selection of spring Wheat for resistance to fusariosis].—*Селекция и семеноводство* [*Selection & Seed Growing*], *1939*, 8, pp. 13–18, 1939.

In an investigation on the cause of the low rate of emergence of spring wheats in the Moscow region, infection with species of *Fusarium* (including several forms from the section *Elegans*, *F. culmorum*, and *F. avenaceum*) was found to be a factor of the greatest importance. Of the species concerned *F. avenaceum* is considered to be the most dangerous. The results of breeding work encourage the hope that the *Fusarium* problem can be controlled by the selection of resistant varieties. High resistance was obtained in hybrid 170 from the cross Local Norwegian × Blue Stem, and hybrid 68 from the cross Milturum 321 × Marquis, both of which gave good yields, the yield percentages for 1938 being 147·6 and 127·8 as compared with 100 for the standard variety Lutescens 062.

NOLL (W.). **El pietín del Trigo (Ophiobolus graminis Sacc.) en el Uruguay. Informe preliminar.** [Foot rot of Wheat (*Ophiobolus graminis* Sacc.) in Uruguay. Preliminary note.]—*Arch. fitotec. Uruguay*, iii, 1, pp. 96–101, 4 figs., 1938. [English and German summaries. Received April, 1940.]

Foot rot of wheat (*Ophiobolus graminis*) is stated to cause heavy damage to the crop (25 per cent. reduction in 1938) in Uruguay, where it is favoured by the mild winter climate and failure to observe a correct rotation. Barley is also liable to severe infection, but oats (wild and cultivated) are practically immune, while rye and other Gramineae suffer little or no injury. Early-sown stands are more severely attacked than late-sown, and the fungus thrives in soils with an insufficient proportion of humus. Control measures based on the correction of these cultural errors are indicated [*R.A.M.*, xix, p. 269]. Among the wild Gramineae to be eradicated from cereal fields is *Lolium multiflorum*, which may serve to perpetuate the parasite in the soil.

PETIT (A.). **Le soufre contre le charbon couvert de l'Orge.** [Sulphur against covered smut of Barley.]—*Ann. Serv. bot. Tunis*, xiv–xv (*1937–8*), pp. 85–90, 1939.

In experiments carried out in Tunis from 1933 to 1938, inclusive, untreated barley seed heavily infected with *Ustilago hordei* gave, on an average, plants with 12·2 per cent. smutted ears, the corresponding figures after treatment with various forms of sulphur ranging from 0·1 per cent. (for Codex precipitated sulphur and 300-mesh white precipitated sulphur) to 1·5 per cent. for flowers of sulphur. No infection at all resulted when the seed was treated with copper chromate or talc with 5 per cent. of polyoxymethylene, but the former is rather expensive, and the latter unpleasant and poisonous to handle. It is concluded that to control barley smut it is only necessary to treat the seed with some finely divided, adherent form of sulphur or sulphocupric product at the rate of 350 gm. per quintal of seed. Finely triturated sulphur, for instance, is eminently suitable.

THORPE (S. K.). **Black-ended Barley grains.**—*J. Inst. Brew.*, N.S., xxxvii, 2, pp. 34–37, 2 figs., 1940.

Attention is drawn to a defect known as 'black end' of barley grains, occasionally affecting 5 per cent. or more of the home-grown crop and also observed in a few samples of the 1938 Californian harvest, accompanied in the latter case by a sugary, glutinous exudate obviously not attributable to dew condensation (to which the condition is referred in England). W. C. Moore and H. Hunter agreed that the disorder was not due to *Alternaria* or *Helminthosporium sativum*, while perusal by J. A. Burns of the relevant American literature indicates no correlation between 'black end' and 'yellow berry' of wheat and other grains. Possibly the absence from the soil of some mineral constituent concerned in the building-up of the cell wall tissues may be responsible for the failure of the starch cells to retain the newly formed product. In the course of the malting process the sugary attachment is washed off from its place in the middle of the ear and no black-ended grains are discernible, whereas in the English material the blackening, situated at the ear base, passes into the malt. The paper is followed by a discussion.

DANKO (N. V.). Закукливание Овса и причины, его вызывающие. ['Zakooklivanie' of Oats and the factors causing it.]—*Селекция и семеноводство* [*Selection & Seed Growing*], *1939*, 9, p. 34, 1939.

The 'pupation' disease of oats [*R.A.M.*, xix, p. 268] was studied during 1937 in the Tulun selection station in the district east of Lake Baikal. The disease is considered to be due to environmental factors causing injury of the growing point. Oats sown in normally dense rows (at the rate of 180 kg. per hect.) suffered considerably less from the disease than when sown in widely spaced rows (at the rate of 20 kg. per hect.), the percentages of diseased plants of the varieties No. 86/5 and Golden Rain being 14 and 17, respectively, in the former case, and 73 and 78·2, respectively, in the latter. It appears that exposure of the plants to full sunlight, involving a higher rate of evaporation of water from the soil, has an adverse effect upon the growing point; plants which emerged on cloudy days with consequently weak insolation and low evaporation rate and were able to complete their initial growth in similar weather showed normal development. The injury is believed to be inflicted in young plants during the rapid changes of weather so typical for Siberia, when sudden strong sunshine after rain produces high temperatures and rapid evaporation of water from the soil. Oats sown on south slopes in heavy, water-retaining soils were found to suffer severely from the disease. No evidence was obtained that the disease was favoured by early sowing of the oats or that it was transmitted by seed. It is tentatively recommended that oats should not be sown on heavy soils and on south slopes, that rapid growth of the plants should be stimulated by applications of fertilizers, and that more dense sowing be adopted.

MOURASHKINSKY (K. E.). Болезни Озимой Ржи в Омской области [Diseases of winter Rye in the Omsk district].—*Омская Область* [*Omsk District*], *1940*, 1, pp. 53–56, 1940.

Apart from the more common diseases of rye occurring in the **Omsk**

district, West Siberia, the author mentions damping-off caused by various species of *Fusarium* (*Calonectria graminicola*, cited as the causal agent in other countries, has not been found in the district [cf. *R.A.M.*, viii, p. 771]); a more important root and stem base rot caused in the southern parts by *Helminthosporium* sp. and in the more northern by *F.* spp.; and more rarely *Leptosphaeria herpotrichoides*, pupation disease [see preceding abstract], noticed in several localities in small amounts, and diseases caused by *Colletotrichum graminicola*, *Marssonina graminicola*, and *Septoria graminum*.

Pathology and mycology of Corn.—*Rep. Ia agric. Exp. Sta., 1938–39*, Part II, pp. 55–62, 1 fig., 1939.

In studies on maize diseases carried out in Iowa in 1938–9 [cf. *R.A.M.*, xviii, p. 243] I. E. Melhus and G. Semeniuk determined the reactions of more than 90 maize varieties to *Ustilago zeae* by field trials. Wide differences between inbred lines and between single crosses were evident, and the limited data obtained indicated that transmission of resistance and susceptibility is unpredictable.

Further investigation by I. E. Melhus into the inhibitor formed by *Diplodia zeae* showed that it is not adsorbed by talc, charcoal, or celite. The nature of the nitrogen source appeared to influence the production of the inhibitor, inhibition occurring much earlier on media containing nitrate as the source of nitrogen than on those containing ammonium salts or asparagin; no inhibition was observed when the fungus was grown for 119 days with leucine as the source of nitrogen.

C. S. Reddy summarizes the results of studies on the effects of cob maturity on resistance in dent maize to *Basisporium gallarum* [*Nigrospora* sp.]. If the secondary ear is about as large as the primary it will not, as a rule, be diseased, but the percentage of infection of secondary ears increases as the ratio of the weight of the secondary ears to the primary decreases; at ratios less than 3 to 10, infection was 80 and 2 per cent. in the secondary and primary ears, respectively. Investigation into the effect of root infection in preventing normal maturity of the cob tissues showed that ten inbred lines resistant to *Nigrospora* had an average pulling test of 137½ lb., while 10 inbred lines with much infection in the ears had a mean pulling test of 76·1 lb. The presence of *Nigrospora* in arrested ear shoots was shown to be one of the chief means of overwintering of the fungus, even in years when ear infection is uncommon.

In greenhouse studies by G. Semeniuk, C. S. Reddy, I. E. Melhus, W. E. Loomis, E. W. Lindstrom, and A. A. Bryan the antibiotic activity of other soil micro-organisms towards *D. zeae* was an important factor in reducing seedling infection. This effect was not, however, appreciably expressed on seed naturally infected with *D. zeae*.

In notes on the plant disease survey of Iowa I. E. Melhus, C. S. Reddy, and R. H. Porter state that in 1938 crown rust (*Puccinia coronata*) of oats reached epidemic proportions in Iowa, causing an estimated loss of yield of 24 per cent. *P. rubigo-vera* var. *tritici* [*P. triticina*] caused an estimated loss in winter wheat of 28 per cent. *Basisporium* dry rot of maize [*N.* sp.] was severe in isolated fields, and some of the hybrid seed, especially that having Osterland 420 or Iodent

205 as a parent, appeared to show much more infection than other hybrid seed stocks. In one field of 939 hybrid seed, 20 per cent. of the ears were infected. Anthracnose (*Gnomonia ulmea*) of Chinese elm occurred in epidemic form on seedlings and more mature trees [ibid., xviii, p. 375].

McNew (G. L.). **Factors influencing attenuation of Phytomonas stewarti cultures.**—*J. Bact.*, xxxix, 2, pp. 171–186, 2 graphs, 1940.

Highly virulent cultures of *Phytomonas* [*Aplanobacter*] *stewarti* from maize were observed in the writer's experiments at the Rockefeller Institute for Medical Research [*R.A.M.*, xix, p. 208] to lose their virulence by a series of steps, the first change being the appearance of a variant of mediocre pathogenicity which became predominant but did not as a rule completely replace the virulent parent type. Eventually, slightly virulent strains (causing only 30 to 50 per cent. infection on Golden Bantam leaves compared with up to 100 for the highly pathogenic) developed and in some cases became dominant. Cultures grown on synthetic agar, in synthetic broth, or in potato-dextrose broth lost much of their virulence after 31 transfers. Such cultures contained scarcely any of the highly pathogenic type of cell and very few of the intermediate. On the other hand, cultures maintained on nutrient dextrose agar, in broth of the same composition, or peptone, were fully virulent at the end of the same period despite the presence of some feebly pathogenic strains. Nutrient dextrose broth cultures incubated at 16° and 26° C. contained the same types of strains in approximately identical proportions, whereas at 36° a considerable attenuation was observed, the weakly virulent strains preponderating and the actively pathogenic being virtually absent. Regular transfers to fresh broth retarded the loss of virulence to some extent. The virulent parent type became extinct between the 34th and 43rd day of culture.

Parker (E. R.), Southwick (R. W.), & Chapman (H. D.). **Response of Citrus trees to manganese applications. A preliminary report.**—*Calif. Citrogr.*, xxv, 3, pp. 74, 86–87, 1 fig., 1940.

In this progress report on studies carried out in southern California on manganese deficiency in citrus trees [*R.A.M.*, xix, p. 143], the authors state that in 1937 young lemon trees in Ventura county produced basically light green leaves with dark green veins; in some leaves the dark green areas about the veins expanded but failed to fill the leaf, such leaves being distributed in all parts of the tree, and being less dwarfed than similar leaves on trees affected with mottle leaf. Some normal leaves were present.

In August, 1939, affected lemons in two localities were treated by applications of manganese chloride (*a*) by insertion of crystals (3 to 8 gm. per 2 in. limb), (*b*) by injection of solution (1 gal. water containing 15 gm. of the salt), and (*c*) by spraying with solution (50 and 100 gm. per gal., the higher concentration also being used with 75 gm. of soda ash [sodium carbonate] per gal.). All the treatments were made on there sets of trees showing symptoms of different severity. A fortnight later, the more severely affected limbs showed definite improvement from all the treatments given. The sprays made without sodium

carbonate caused some burning. By 9th October, the leaves on the treated trees were almost entirely free from mottle, though those on the untreated limbs still showed definite symptoms.

Affected lemon and orange trees were sprayed with manganese sulphate at three concentrations (0·5, 1·0, and 3·0 lb. metallic manganese per 100 gals.) with the addition of hydrated lime or sodium carbonate. Three grades of manganese sulphate were used: one pure, expensive grade of the anhydrous salt and two more economical materials containing 65 or 80 per cent. manganese sulphate. The lowest-grade material sometimes contained ingredients objectionable in spraying. The two higher concentrations gave earlier responses than the lowest which did, however, induce definite improvement. So far, small plots have been treated in about 60 orchards, and all the trees showing leaf symptoms have improved as a result of the treatments, though the untreated trees still show definite symptoms. On the evidence so far available it is recommended that experimental applications should be made with a spray consisting of 10 lb. manganese sulphate (65 to 80 per cent. pure, spraying grade), 5 lb. sodium carbonate, and 100 gals. water. The best time of year to make the treatment is not yet known.

Bates (G. R.). **Growth behaviour of plants following seed treatment by organic mercury compounds.**—*Nature, Lond.*, cxlv, 3668, pp. 262–263, 1940.

The author suggests that in the light of Kostoff's recent paper [*R.A.M.*, xix, p. 269] the control of citrus albinism by organic mercurials as reported by Perlberger and Reichert [ibid., xviii, p. 247] may possibly be due to the effect of the seed treatment on mitosis.

Bitancourt (A. A.) & Jenkins (Anna E.). **Ciclo evolutivo de 'Elsinoë australis Bitancourt & Jenkins', agente da verrugose da Laranja Doce.** [The life-history of *Elsinoe australis*, the agent of Sweet Orange scab.]—*Arq. Inst. biol. S. Paulo*, x, pp. 129–146, 9 pl., 1939. [English summary.]

This comprehensive study of the life-history of *Elsinoe australis*, the agent of scab of sweet orange and other citrus fruits in South America [see below, p. 341], is stated to be based mainly on an examination of the type specimen [*R.A.M.*, xvi, p. 95], supplemented by the only other example of the perfect stage hitherto discovered (also from Brazil). The other countries in which the disease occurs are the Argentine, Uruguay, and Paraguay.

Monospore cultures from ascospores of the type specimen were germinated in water and on the surface of potato dextrose agar. In water the ascospores rapidly gave rise to conidia, germinating by means of germ-tubes, the length of which, after 24 hours, sometimes exceeds 20 times that of the conidia. As a rule, the conidia separated rapidly from the ascospores in the water cultures, but in one instance, in which evaporation reduced the amount of water to a film surrounding the ascospores, the conidia remained attached to the latter and germinated *in situ*. On the agar medium germination took place by means of germ-tubes arising from each cell of the ascospore, which quickly branched out into a spherical thallus with setose hyphae extending from the surface. Sections of acervuli and underlying tissue gave rise

in 24 hours in a drop of potato dextrose agar to new hyphae, which were absent from the tissues within the phellem and the phellem itself. The further development of the thalli from these cultures was essentially identical with that from the ascospores.

Further proof of the genetic connexion between the two stages was secured between 1936 and 1938 by field inoculations on three sweet orange varieties, Abacaxi, 'pear', and 'lime', and a variety of tangerine orange, in which the percentages of positive results obtained with the ascospore and conidial cultures were 77 and 79 per cent., respectively. The experimental injuries resulting from these artificial inoculations produced the characteristic fructifications of the imperfect stage, and revealed an anatomical structure conforming to that observed in natural lesions.

Two cultures from the type specimen, a single ascospore culture, a culture from a microsection of an acervulus, and a reisolation culture were compared on potato dextrose agar with eleven earlier isolates of the fungus, including saltations of each of the three groups already described as (1) viscous, (2) black, and (3) velvety; the three new cultures were all found to belong to group (2). A growth type represented by three isolates of 1935 was designated as group (4) reddish.

STAHEL (G.). **Corticium areolatum, the cause of the areolate leaf spot of Citrus.**—*Phytopathology*, xxx, 2, pp. 119–130, 7 figs., 1940.

Areolate leaf spot of citrus, which is stated to be prevalent in Dutch Guiana, where sour oranges were severely affected 20 years ago during the heavy rains, was attributed by Bondar in 1929 to *Leptosphaeria citricola*, and by Bitancourt and Jenkins in 1935 to *L. bondari* [*R.A.M.* xv, p. 90]. The author's studies on the fungus in question showed the mycelium to be quite distinct from that of *L. bondari*, which is a common saprophyte.

The light brown spots produced by the pathogen on the leaves of susceptible fruits, such as sour orange, grapefruit, pomelo, and mandarin, are enlarged each morning by one new water-soaked ring, 1 mm. in width, which during the day turns brown and collapses, impregnating the contiguous tissue with yellowish gum. At night, under humid conditions, this gummed barrier is passed by the fungus and a new ring added. The rings of gummed cells do not collapse but form the concentric, dark brown ridges typical of the disease. Usually the rings number 10 to 20 per lesion, but up to 47 have been counted on the branched spots sometimes formed by the passage of the organism through breaches left in the barrier after its closure with the advent of dry weather. Some of the primary necrotic spots, $\frac{1}{2}$ to 1 mm. in diameter, do not expand at all under dry conditions, while others do so asymmetrically. The lower leaf surfaces are frequently covered in wet weather with a whitish mildew consisting of the mycelium of the fungus, which grows from the fallen foliage into the soil, where it probably persists through the dry season in the form of sclerotia (though these have only been observed in culture). Primary spots, which do not expand, have been observed on young, green twigs, but not (in the author's experience) on the fruits. The small black points on the oldest parts of the spots are the perithecia of *L. bondari*.

The causal organism of the areolate leaf spot, *Corticium areolatum* n. sp. [with a Latin diagnosis], is readily isolated on Sabouraud's agar, whence it may be transferred to other media, e.g., sterilized potato slices, on which sclerotia were formed most abundantly. These organs are dark brown, flat, 1 mm. in diameter, and consist of clumps of swollen hyphae without a cortex. The epiphyllous mycelium is composed of straight, light brown hyphae, with hyaline lateral branches of swollen cells bearing basidia, 10 to 14 by 8 to 10 μ, with four (rarely two) sterigmata, 10 to 13 μ long and 3 to 3·5 μ thick at the base, producing smooth, hyaline, papillate spores, 8 to 9 by 5 μ, which germinate in water and on agar within 12 hours. The germ-tubes grow very slowly and form irregular swellings, developing after four to five days into sclerotia, which in turn give rise to the mycelium. In inoculations on young grapefruit leaves the basidiospores germinate immediately, producing a minute appressorium and penetrating the cuticle. The resultant germ-tube grows as a flat hypha for a short distance between the cuticle and epidermal cells, before entering the deeper tissues. In the mesophyll just below the site of spore germination a sclerotium develops and kills the tissue as the leaf approaches maturity. The hyphae radiate into the dead tissue and the primary spot thus formed grows out into an 'areolate' (more correctly 'aureolate', but the accepted orthography is retained to avoid confusion) lesion as described above. No true hymenium is formed, the basidia being scattered over the side branches of the fertile mycelium covering the substratum like a cobweb. Inoculations with the mycelium and sclerotia were also successful. The disease may be effectively controlled by collecting and burning the fallen leaves; spraying with Bordeaux mixture, and in wet weather spraying the soil and, if necessary, affected leaves, especially on the under side, are beneficial.

FAWCETT (G. L.). **Observaciones sobre algunas de las enfermedades presentes en los Cítricos de Tucumán.** [Observations on some of the diseases affecting Citrus trees in Tucumán.]—*Rev. industr. agric. Tucumán*, xxix, 7–9, pp. 176–178, 1939.

This is a popular account of the more important diseases of citrus trees in Tucumán (Argentine) [cf. *R.A.M.*, x, p. 24], viz., gummosis (*Phytophthora citrophthora* and *P. parasitica*), anthracnose (*Colletotrichum gloeosporioides*) [ibid., xv, p. 14], *Septoria citri*, psorosis [ibid., xv, p. 13], sour orange scab (*Sphaceloma* [*Elsinoe*] *fawcetti*), sweet orange scab [*E. australis*: see above, p. 339], melanosis (*Diaporthe citri*) [ibid., xviii, p. 238], exanthema, and chlorotic disorders of various types, with directions for their control.

PFÄLTZER (A.). **Topsterfte-bestrijding speciaal in verband met rejuvenatie.** [Top die-back control, especially in connexion with rejuvenation.]—*Bergcultures*, xiv, 7, pp. 228–229, 1940.

Practical directions are given for the radical control of top die-back of coffee [*Rhizoctonia* sp.: *R.A.M.*, xviii, p. 729] in Java, with special reference to the provision of sound stocks for the scions in the grafting operations incidental to the establishment of new plantings, and to the

protection of the fresh growth from direct infection. It is pointed out that the work of 'rejuvenation' affords a favourable opportunity for drastic intervention in the matter of top die-back, since the necessary loss of branches and fruit-bearing wood entailed by severe pruning is of little economic importance at this stage in the life of the plantation.

CARNEIRO (J. G.) & PICKEL (D. B.). **Catálogo das bacterias e dos fungos do Caféeiro.** [A list of the bacteria and fungi of Coffee.]—184 pp., S. Paulo, Secretaria da Agricultura, 1940.

This is an annotated list, supplemented by bibliographical references, of the bacterial and fungal diseases affecting coffee in South and Central America and the other countries in which the crop is grown [cf. *R.A.M.*, xv, p. 717].

HANSFORD (C. G.). **Vascular diseases of Cotton in Uganda.**—*E. Afr. agric. J.*, v, 4, pp. 279–282, 1940.

Vascular diseases of cotton, caused by *Verticillium dahliae* and strains of the *Elegans* section of *Fusarium* [*R.A.M.*, xviii, pp. 574, 575], and termed by the author the 'cotton wilt complex', have become increasingly prevalent in Uganda during the past ten years. Cross-inoculation studies indicate that the individual strains of *F.* found on the Kampala plantation are able to infect a number of different crops, though only certain individuals are susceptible in each. Inoculation tests with *V. dahliae* produced instances of wilt on every variety of every crop tested. At present, laboratory investigations in Uganda are directed at isolating as many wilt organisms as possible, and testing each on a wide range of local crops and common weeds; in this way it is hoped to ascertain what rotations are safe with cotton.

The cotton varieties grown in Uganda are very heterogeneous, and attempts are in progress to select resistant strains [cf. ibid., xix, p. 14]. So far, no immune or highly resistant variety has been found, but there are marked differences in susceptibility, B.P. 50 being more susceptible than the standard Buganda Local variety, and B. 181 less susceptible than either. Experimental evidence demonstrated that resistance is modified by soil or climatic conditions, cotton grown on land heavily dosed with infected material every year showing little or no increase in wilt incidence, while in other parts of the same plantation incidence became annually progressively higher. Experiments by J. D. Jameson at Bukalasa showed that percentage incidence was less when the space between crops was reduced, and that when a widely spaced crop was interplanted with groundnuts or beans, wilt was reduced. This result would appear to indicate that at Bukalasa, where soil temperatures range from 76° to 80° F., shading of the ground reduces liability to wilt; in the Eastern Province of Uganda, where the soil temperatures are higher, wilt prevalence tends to be greater under shade. In central Uganda, incidence has risen steadily in certain areas, probably as a result of the distribution of infected soil and infected seed. In single plots spread occurs progressively, though not uniformly, from the original infection centres. The disease has not, however, so far caused important damage to the crop as a whole.

CUMLEY (R. W.) & GOLDSMITH (G. W.). **Preliminary serological studies of Phymatotrichum omnivorum.**—*Phytopathology*, xxx, 2, pp. 130–139, 1940.

In order to determine the systematic affinities of the cotton root rot fungus, *Phymatotrichum omnivorum*, a preliminary serological study was undertaken at the University of Texas, involving two methods of securing material. In the first, young sporophores of *Tyromyces palustris*, *Psalliota sylvatica*, *Clitocybe illudens*, *Lycoperdon gemmatum*, *Calvatia cyathiformis*, *Secotium acuminatum*, and *Ustilago maydis* [*U. zeae*] were collected in the field, washed, dried over sulphuric acid at 50° C., and stored in glass jars at 5°. In the second, pure cultures of *Rhizopus nigricans*, *Aspergillus niger*, *Penicillium luteum*, *Hormodendrum cladosporioides* [*R.A.M.*, xvii, p. 114], *Fusarium* sp. of the *Elegans* section, *Sclerotium rolfsii*, and *Phymatotrichum omnivorum* were grown in a liquid nutrient (non-protein) medium, removed when sufficiently developed, washed, dried in an incubator at 40° to 45°, and stored at 5°. The results [which are discussed and tabulated] of precipitin and complement fixation tests with rabbit sera prepared against *P. omnivorum* indicated a closer relationship between *P. omnivorum* and the puffballs, *L. gemmatum*, *Secotium acuminatum*, and *C. cyathiformis* than with any of the other genera, thereby supporting Presley and Thom's conjecture as to the taxonomic position of the root rot pathogen among the Gasteromycetes [ibid., xvi, p. 606].

ATTIMONELLI (R.). **Reperto di blastocisti nelle Mosche.** [Detection of blastocysts in Flies.]—*Pathologica*, xxxii, 580, pp. 59–61, 1940. [German and English summaries.]

At the Bari (Italy) Institute of Hygiene and Bacteriology the writer detected the presence of *Blastocystis hominis* [*R.A.M.*, xix, p. 277] in the digestive tract of 1·6 per cent. of the flies (*Musca domestica*) examined [ibid., xii, p. 508]. The normal features of the pathogen, however, were so much altered as to suggest that their habitat was a very inappropriate one for conservation and development.

EVLAKHOVA (Mme A. A.). Новый дрожжеподобный грибок **(Blastodendrion pseudococci nov. sp.),** патогенный для мучнистых червецов. [A new yeast-like fungus (*Blastodendrion pseudococci* nov. sp.) pathogenic to Mealy Bugs].—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 79–84, 3 figs., 1939.

A new fungus, *Blastodendrion pseudococci*, was isolated from mealy bugs (*Pseudococcus citri*), which died when exposed to conditions of excessive humidity in the laboratory, and its pathogenicity proved, several artificial infection experiments giving 50 to 100 per cent. killing. The growth of the fungus on culture media and some of its morphological and physiological characters are described but no diagnosis is given.

HENRICI (A. T.). **Characteristics of fungous diseases.**—*J. Bact.*, xxxix, 2, pp. 113–138, 6 figs., 1 diag., 1 graph, 1940.

In this presidential address to the Society of American Bacteriologists on 29th December, 1939, the view is advanced that the outstanding characteristic of the human mycoses is their strong tendency to give

rise to a particular type of hypersensitivity (allergy), upon which the other features of the diseases, such as age, occupational incidence, course, and pathology, are largely dependent. This characteristic differentiates the mycoses from most maladies of the microbic group, but closely relates them to tuberculosis and (in some aspects) to leprosy and other diseases. The striking divergences in respect of distribution, growth habit, and other characters between deep-seated and superficial mycoses should not obscure their fundamental affinity.

MACKINNON (J. E.). **Dissociation in Candida albicans.**—*J. infect. Dis.*, lxvi, 1, pp. 59–77, 9 figs., 1940.

In his studies at the Institute of Experimental Hygiene, Montevideo, Uruguay, the writer has observed two types of spontaneous variation in pure cultures of *Candida albicans* (strain 582, isolated from a case of paronychia, and others), designated membranous and lethal [*R.A.M.*, xix, p. 278]. Variation in the membranous direction is characterized by the elongation of the blastospores into pseudohyphae, accompanied by gradual modifications in the macroscopic appearance of the colonies on Sabouraud's glucose agar, which are enveloped by a filamentous halo and become successively rugose, opaque, and finally, in extreme cases, spiky and hard. In a liquid medium the development of the membranous form coincided with a diminution in virulence. Partial reversion from the membranous to the normal creamy form has been observed, but the reverted variants are unstable and tend to develop once more into the membranous condition.

Lethal variation involves a reduction in the rate of growth and great diminution or total loss of virulence. Both types of variation may occur in the same strain, giving rise to forms combining lethal and membranous characters, or a strain that has varied in the lethal direction may later assume the membranous form, and vice versa.

The membranous variant of *C. albicans* described by the author in 1936 (*Arch. Soc. Biol. Montevideo*, vii, p. 162) is considered to be homologous with those observed by a number of workers in true and non-pathogenic red yeasts, and identical with the R form of Besta (1938) [*R.A.M.*, xvii, p. 676] and Cavallero (1939) [ibid., xviii, p. 394]. On the other hand, Negroni's R form (*R. Soc. argent. Biol.*, xi, p. 449, 1935) is identical with the writer's lethal variant. As in the red yeasts, variation of the types described in *C. albicans* is accompanied by modifications of pigmentation, which may be used as an additional criterion.

It is apparent from these data that *C. albicans* is capable of producing a theoretically infinite number of possible combinations, a fact that readily accounts for the existing confusion in its nomenclature. The methodical study of hereditary variations in pathogenic fungi is considered to be of outstanding importance in their identification and classification.

DOWNING (J. G.), MERRILL (BEULAH), & BELDING (D. L.). **A clinical and laboratory study of the incidence of fungi in patients with cutaneous eruptions.**—*New Engl. J. Med.*, cxxii, 7, pp. 263–266, 1940.

During the period from July, 1938, to July, 1939, 179 (37·6 per cent.)

of the patients with cutaneous eruptions at the Boston City Hospital yielded positive evidence of fungal infection either by direct examination (73·7 per cent.) or by culture (78·7), the former method having been found preferable in the cases of *Microsporon*, *Trichophyton*, *Epidermophyton*, and *Malassezia*, and the latter in those of *Monilia* [*Candida*], *Cryptococcus*, and *Mycoderma*. The 60 positive cultures of *Microsporon* consisted of 17 *M. audouini*, one *M. gypseum*, and 42 *M. lanosum*, while *Trichophyton* was represented by *T. gypseum* (10), *T. purpureum* (6), and unclassified (8). *E. floccosum* occurred in three patients, while 24 of the 37 cultures of *Candida* were identified as *C. albicans*. Undetermined species of *Cryptococcus*, *Mycoderma*, and *Malassezia* were detected in 11, 7, and 11 cases, respectively.

GRIGORAKI (L.) & DAVID (R.). **Caractères bio-chimiques de Trichophyton radians (Sabouraud, 1909).** [Biochemical characters of *Trichophyton radians* (Sabouraud, 1909).]—*C.R. Soc. Biol., Paris*, cxxxiii, 2, pp. 234–236, 1940.

Continuing their studies on the biochemical characters of the dermatophytes [*R.A.M.*, xix, p. 279], the writers found that *Trichophyton radians* [ibid., xv, p. 218] peptonizes milk in 40 days, liquefies gelatine slowly, and produces the most characteristic changes in the colour of carbohydrate solutions after ten days. These characters are quite distinct from those of *T. asteroides* [*T. mentagrophytes*: ibid., xix, p. 216] and *T. lacticolor* [ibid., xviii, p. 678], which have been placed in the same clinical group, and tend to confirm the botanical differentiation of the species.

GOUGEROT (H.) & DUCHÉ (J.). **Epidermite due au Sporotrichum gougeroti.** [Epidermal inflammation due to *Sporotrichum gougeroti*.]—*Bull. Soc. franç. Derm. Syph.*, xlvi, 8, p. 1455, 1939.

To the 19 cases of sporotrichosis caused by *Sporotrichum gougeroti* cited in *Nouv. Prat. derm.*, ii, p. 498, 1936, may now be added a further two, one observed by the authors in a 49-year-old commercial traveller suffering from interdigital eczema, and the other by Rabello in Brazil [*R.A.M.*, xviii, p. 595].

FELDERMAN (L.). **Infection with Aspergillus niger: report of two cases.**—*Arch. Otolaryng., Chicago*, xxxi, 2, pp. 327–331, 1 fig., 1940.

Clinical details are given of two cases of aspergillosis of the upper air passages, both in women, treated by the author at Philadelphia and referred on the basis of cultural studies to *Aspergillus niger* [*R.A.M.*, xix, p. 218].

BLAICH (W.). **Beitrag zur Kenntnis der Pityriasis versicolor.** [A contribution to the knowledge of pityriasis versicolor.]—*Derm. Wschr.*, cx, 4, pp. 65–70, 4 figs., 1940.

Two atypical cases of pityriasis versicolor treated by the writer at the Münster (Westphalia) Dermatological Clinic are described, one in a 17-year-old domestic servant and the other in a soldier. The symptoms in the former patient were of the lichenoid type, presumably representing the initial stages of the disorder, while in the latter both the 'white'

and 'black' forms of pityriasis were observed. *Malassezia furfur* [*R.A.M.*, xix, p. 94] developed in a very abnormal and irregular manner on urine-agar (1 : 10) cultures from the first patient, but all attempts to isolate the fungus from the second gave negative results. These data further exemplify the well-known difficulty of culturing *M. furfur* [see next abstract].

MOORE (M.). **Malassezia furfur, the cause of tinea versicolor: cultivation of the organism and experimental production of the disease.**—*Arch. Derm. Syph., Chicago*, xli, 2, pp. 253–260, 4 figs., 1940.

The writer has already reported his success, after considerable difficulty, in the culture of *Malassezia furfur* from pityriasis versicolor lesions [*R.A.M.*, xvii, p. 678 and preceding abstract], and here reviews the characteristics of the organism in the tissues and in culture and gives further data on the experimental inoculation of the fungus into laboratory animals, human volunteers, and the chorioallantoic membrane of the developing chick [ibid., xviii, p. 738].

In young lesions the fungus, which was isolated from nine patients at the Barnard Free Skin and Cancer Hospital, St. Louis, Missouri, appears as a filamentous, branching mycelium, 1·5 to 2 μ in diameter; in older ones cross walls and short hyphal cells are formed, 1·5 to 4 μ in diameter and 10 to 16 μ in length, which in turn develop into spherical, free, arthrosporous cells, 3 to 8 μ in diameter. The colonies of the organism produced at 37° C. on artificial media, of which 1 per cent. peptone and 4 per cent. maltose was the most satisfactory, are flat, dull or moist, mucoid, shiny, verrucose, cerebriform or rugose, vermiculate, and of a velvety consistency; an arborescent habit is specially characteristic of wort agar cultures. The colour varies on different substrata from whitish-grey and fawn to creamy buff and light cinnamon in young cultures to ochraceous buff and dark cinnamon in older ones. The thick-walled, spherical, ovoid, or ellipsoid arthrosporous cells budded off from the hyphae measure 4 to 10 μ in diameter. Chains of thick-walled, sclerotic cells, with fine, non-septate, dendritic, and intertwining hyphae, are also formed. *M. furfur* liquefies gelatine, acidifies litmus milk, and evolves acid but no gas from dextrose, d-oxylose, amygdalin, and d-levulose.

Experimental inoculations on laboratory animals by the percutaneous method or application of the fungus to the intact skin gave negative results. Intracutaneous injections into rabbits and guinea-pigs resulted in granulomatous lesions. Three out of eight human volunteers responded positively to skin inoculations, while the transplantation of the organism to the chorioallantoic membrane of a developing chick induced a reaction in the layers of this structure, with a reversion of the cells to the morphological pattern typical of scrapings from human lesions.

PALO (M. A.) & CALINISAN (M. R.). **The bacterial wilt of the Abacá (Manila Hemp) plant in Davao. I. Nature of the disease and pathogenicity tests.**—*Philipp. J. Agric.*, x, 4, pp. 373–395, 15 pl. (1 col.), 1939.

The most serious disease of abacá in the Davao and Cotabato Provinces of the Philippines is stated to be the one previously reported

as vascular disease or wilt [*R.A.M.*, xviii, p. 256]. A survey in Davao (covering only about one-fourth of the total abacá-growing area) during May, 1937, to December, 1938, showed a total of 1,301·5 hect. affected by the disease; of these, 1,059 hect. have now been eradicated and partly replanted with the resistant Tañgoñgon variety. The most striking external symptoms of the disease are rust-brown linear streaks along the veins on some or all leaves, followed by a yellowing of the tissues along the veins and ultimately a browning and wilting. In cases of acute infection plants wilt rapidly without showing linear streaks. Other external symptoms are a conspicuous retardation of growth of the central leaf; narrowing of the leaves (most common in the Lauan-Tañgoñgon variety); and the appearance of large blackish-brown patches of rotting tissue at the base of the pseudostem. An examination of sections of the rhizome and pseudostem showed that the vascular strands of affected plants are discoloured, the spread of the infection being easily traced up to the petioles and midribs and out into the leaf veins. Weevil borers, such as *Cosmopolites sordidus* and *Odoiporus paganus*, sometimes found in affected plants are considered of minor importance as causal agents, although their attacks weaken the plants and predispose these to infection. Large numbers of actively motile bacteria were always found in the rusty-brown linear streaks on the leaves and the discoloured vascular strands of the petioles, midribs, and leaf sheaths, but none were observed in the deeply stained strands of the pseudostem and rhizome in advanced stages of infection, the reason for this being still unknown. *Fusarium* mycelium was, on the other hand, occasionally found in the deeply stained strands of the rhizome and pseudostem, but never in the infected veins of the leaves. The causal bacterium was isolated with much difficulty, as it was often outgrown by other faster-growing, probably secondary, organisms. The colonies of the pathogenic bacterium formed after three to four days resembled those of *Bacterium solanacearum*; they were white, wet, shining, and showed a tendency to flow. This bacterium was more easily isolated from fresh material in the early stages of infection, but never from tissues from advanced stages. Inoculations of Maguindanao plants by either needle pricks or hypodermic injection into the midribs of the heart leaves and pseudostem gave positive results, whereas hypodermic injection into the corm was unsuccessful. The response of the inoculated plants to the wilt organism was very irregular with respect to the time required to contract the disease and the amount of symptoms shown. The organism was reisolated from some of the successfully inoculated plants.

MATSUMOTO (T.). **Need of reinvestigation on the use of Trichoderma as a means of biological control.**—*J. Soc. trop. Agric. Taiwan*, xi, 4, pp. 322–326, 2 figs., 1939. [Japanese, with English summary.]

Root rot of roses, *Croton* spp., and other ornamentals, due to a species of *Trichoderma*, allied to *T. koningi* [*T. viride*: *R.A.M.*, xviii, p. 761] has been observed for several years in Taihoku, Formosa [ibid., xviii, p. 413]. The aerial symptoms of the disease include cessation of growth and loss or pale greenish discoloration of the foliage, generally followed by the premature death of the plants. The roots are covered with a

dense, white mycelium. The results of inoculation experiments indicated that the fungus is rather a weak parasite, attacking plants weakened by transplanting or some other cause. In culture the fungus parasitized the hyphae of *Hypochnus* [*Corticium*] *sasakii* [ibid., xviii, p. 617] and inhibited their growth in exactly the same manner as described by Weindling for *T. lignorum* [*T. viride*] on *Rhizoctonia* [*C.*] *solani* [ibid., xiv, p. 188]. When a leaf of *Eichhornia crassipes* was simultaneously inoculated with *C. sasakii* and the garden *Trichoderma*, little or no infection by the former takes place, whereas in the absence of the soil organism invasion by the *Corticium* is extensive. A re-investigation of the practice of combating soil pathogens by means of *Trichoderma* is considered in the light of these data to be strongly indicated.

LYLE (E. W.). **Rose diseases.**—*Circ. Tex. agric. Exp. Sta.* 87, 16 pp., 7 figs., 1940.

Popular notes are given on the symptoms, cause, and control of the chief diseases of roses in Texas, viz., black spot (*Diplocarpon rosae*), powdery mildew (*Sphaerotheca pannosa* var. *rosae*), die-back (associated with various fungi, particularly a species of *Diplodia*), crown gall (*Phytomonas* [*Bacterium*] *tumefaciens* and *P.* [*Bact.*] *rhizogenes*), root rot (*Phymatotrichum omnivorum*), *Cercospora* leaf spot (*Mycosphaerella rosicola* [the ascigerous stage of *C. rosicola*: *R.A.M.*, xvii, p. 753]), rust (*Phragmidium* spp.), mosaic, streak, and stem canker (*Coniothyrium fuckelii*). Of these, the first five are of the greatest economic importance locally.

When rose roots have become partly decayed owing to infection by *Phymatotrichum omnivorum*, the whole top turns yellow, suddenly wilts, and may rapidly die. The disease is particularly destructive in wet seasons, and is more prevalent and injurious in neutral to alkaline than in acid soils. The disease, almost unknown in eastern Texas, is of considerable importance in the central and western parts of the State, where, after the removal of rose bushes killed by it, the fungus may survive in the ground for years. As roses are less susceptible to infection than some other plants, and as they bloom quickly under Texas conditions, they can be grown, even in the presence of the disease, if they are replaced every few years. They should be planted in small groups, separated by lawns, not in continuous rows.

Leaf spot due to *M. rosicola* is often confused with black spot (*Diplocarpon rosae*), but in the former disease the spots are smaller, the margins fringeless, and the centres brown or a lighter colour than in black spot; also, defoliation is less marked than is the case with *D. rosae*. Locally, the disease is quite common, especially on understocks of Multiflora varieties, but it is rarely serious enough to require control measures.

KRELAGE (H.). **Het onderzoek der Hyacinthenziekten. Een episode uit het prae-phytopathologische tijdvak.** [The investigation of Hyacinth diseases. An episode from the pre-phytopathological era.]—*Tijdschr. PlZiekt.*, xlvi, 1, pp. 30–45, 1940.

Extracts are presented from the correspondence between J. H.

Krelage (1824–1901), H. de Vries (1848–1935), and J. H. Wakker (1859–1927) concerning the investigation and control of hyacinth diseases in Holland, showing what intensive study and unremitting efforts were necessary over a period of many years to place this important adjunct of the bulb-growing industry on a sound scientific and financial basis before the introduction of modern phytopathological facilities.

Brierley (P.) & Doolittle (S. P.). **Some effects of strains of Cucumber virus 1 in Lily and Tulip.**—*Phytopathology*, xxx, 2, pp. 171–174, 2 figs., 1940.

This note records the results of the authors' cross-inoculation studies at the United States Horticultural Station, Beltsville, Maryland, with viruses of the tulip and cucumber virus 1 groups [cf. *R.A.M.*, xviii, p. 317] for which there is no evidence of a close relationship.

Strains of cucumber virus were not found occurring naturally in tulips or alone in commercial Easter lilies (*Lilium longiflorum*). When such strains were experimentally introduced into seedling Easter lilies they did not induce symptoms, with the exception of one virulent strain which caused 'yellow top' rather than 'fleck' symptoms. A suggested explanation of the discrepancy between these results and those of Price [ibid., xvi, p. 615] is that some of Price's experimental plants were carrying the latent lily virus of McWhorter [ibid., xvii, p. 41] (a tulip virus commonly present in symptomless Easter lilies), and that the fleck symptoms are a response to double infection.

Cucumber mosaic strains, experimentally introduced into tulips, produced no recognized effects in the current season but induced flower breaks in the following year, as do the tulip viruses. On the other hand, tulip viruses from lily and tulips induce symptoms in *L. formosanum* in two weeks.

Dell' Angelo (G. G.). **Malattie crittogamiche del Garofano. Heteropatella valtellinensis (Trav.) Wr (H. dianthi Buddin et Wakef.; Pseudodiscosia dianthi Hösterm. et Laub.).** [Fungal diseases of the Carnation. *Heteropatella valtellinensis* (Trav.) Wr (*H. dianthi* Buddin & Wakef.; *Pseudodiscosia dianthi* Hösterm. & Laub.).]—*Costa azzur. agric.-flor.*, xix, 11–12, pp. 184–188, 2 figs., 1939.

Notes are given on the history, geographical distribution, economic importance, causal organism, symptoms, and control of carnation leaf rot (*Heteropatella valtellinensis*) [*R.A.M.*, xv, p. 468]. In Italy the disease was observed in 1930 on the Stacchini variety at San Remo, in 1935 on material from Rimini, and in 1936 on carnations from Pescia. In no instance was infection serious, and it is not considered probable that the disease will become a problem in Italy, where carnations are grown out-of-doors.

Dell' Angelo (G. G.). **Malattie crittogamiche del Garofano: Alternaria dianthi Stev. e Hall.** [Fungal diseases of the Carnation: *Alternaria dianthi* Stev. & Hall.]—*Costa azzur. agric.-flor.*, xx, 1–2, pp. 14–18, 1 fig., 1940.

A brief, popular account is given of the history, geographical

distribution, economic importance, symptoms, cause, and control of carnation blight (*Alternaria dianthi*) [*R.A.M.*, xvi, p. 659]. The disease was first recorded in Italy in 1915, on plants from Genoa; a second report was made from Palermo in 1929 on carnations introduced from the Ligurian Riviera [ibid., x, p. 386]; and a third attack, described as severe, was noted in 1935 at San Remo. From two years' observations the author concludes that the disease is not very extensively present in the vicinity of San Remo. Even in periods very favourable to the fungus, infection is confined to limited areas. The disease becomes dangerous only if it attacks the few individuals of highly prized varieties being used for propagating purposes.

CALVINO (EVA M.). **Due casi di 'cancro della Gardenie'.** [Two cases of *Gardenia* canker.]—*Costa azzur. agric.-flor.*, xix, 11–12, pp. 189–190, 1939.

In August 1935 and again in February 1937 the author received *Gardenia* plants affected by canker caused by *Phomopsis gardeniae* [*R.A.M.*, xviii, p. 33], the material in the latter year coming from Piacenza. Growers are recommended to adopt preventive spraying with a fungicide and to use cuttings from healthy plants only. It is thought that infection may be favoured by the practice of growing *Gardenia* plants in soil mixtures containing chestnut leaf mould, which holds a great deal of moisture; a mixture of heath and soil, or fibrous turf, would be preferable.

BOTTOMLEY (A[VERIL] M.). **A destructive Antirrhinum disease new to South Africa.**—*S. Afr. hort. J.*, ii, 2, p. 17, 1 fig., 1940.

Snapdragon (*Antirrhinum* [*majus*]) rust (*Puccinia antirrhini*) [*R.A.M.*, xviii, p. 740] has recently appeared for the first time in some coastal towns in South Africa, especially in the Eastern Cape and Natal. Until further information is available, it is recommended that only resistant varieties should be planted, infected soil should be avoided, and that all diseased plants should be burnt. The disease has probably been introduced by infected seed; every one of twelve seed samples obtained from various commercial sources was found to be contaminated.

HANSEN (H. N.) & THOMAS (H. EARL). **Flower blight of Camellias.**—*Phytopathology*, xxx, 2, pp. 166–170, 2 figs., 1940.

Sclerotinia camelliae n. sp. [without a Latin diagnosis], the agent of a brown spotting of *Camellia japonica* flowers in California affecting 50 varieties and causing up to 100 per cent. loss in wet weather, is characterized by buff-olive, later darkening, apothecia, with a cyathiform to discoid disk, 5 to 20 mm. in diameter and a stipe 3 to 40 mm. long and 2 to 3 mm. in diameter below the disk, tapering to 0·5 to 1 mm. at the base; cylindrical asci, 100 to 125 by 4·3 to 5·8 μ, containing eight uniseriate, ellipsoid, continuous, hyaline ascospores, 5·3 to 7 by 2·5 to 3·5 μ; filiform, septate paraphyses, 110 to 130 by 1·2 to 2·5 μ; dark brown to black sclerotia, up to 30 by 12 mm., usually laminated to simulate the imbricate arrangement of the flower petals; and globose to piriform, concatenate, hyaline (jet-black in the mass) microconidia,

2·5 to 3·5 μ, produced in a sporodochium composed of numerous clusters of conidiophores ending in tapering, elongated terminal cells. In pure culture on potato dextrose agar or sterilized whole wheat microconidia are most rapidly and abundantly formed at 24° C., vegetative development being more profuse at 15° to 18°. Infection is caused solely by ascospores and, since sclerotia are formed in the flowers only, control should be practicable by the destruction of all fallen flowers for several consecutive seasons (a minimum of two, since the sclerotia are known to persist in the soil for at least two years).

REMSBERG (RUTH E.). **The snow mold of grains and grasses caused by Typhula itoana and Typhula idahoensis.**—*Phytopathology*, xxx, 2, pp. 178–180, 1940.

Two species of *Typhula* have been found to be associated with the snow mould of cereals and grasses, that occurring most commonly in the United States, Europe, and Japan being *T. itoana* [*R.A.M.*, xviii, p. 298], frequently described under the name of *T. graminum* or *Sclerotium fulvum* [ibid., xvii, p. 230]. The second species, often collected in the western United States, is *T. idahoensis* Remsberg, with which the fungus designated *T. borealis* by Ekstrand in Sweden [ibid., xvi, p. 802] is probably identical. There is further a possibility, not yet fully explored, that *T. graminum* may also cause a snow mould.

FISCHER (G. W.). **Fundamental studies of the stripe smut of grasses (Ustilago striaeformis) in the Pacific Northwest.**—*Phytopathology*, xxx, 2, pp. 93–118, 4 figs., 1940.

This further instalment of the writer's studies on the stripe smut (*Ustilago striaeformis*) of grasses in the Pacific North-west [*R.A.M.*, xviii, p. 441] deals principally with certain aspects of the life-history, physiology, and pathogenicity of a new race of the fungus collected on *Agropyron pauciflorum* and *Elymus glaucus* differing from those previously recognized in important features of the germination process. In the first place, no after-ripening under moist conditions was found to be necessary for successful germination during the seven-month period of viability. The germinating spore extrudes two or three thick germ-tubes, which rapidly elongate and develop cross walls and branches. This complex promycelium in turn buds off typical elliptical sporidia, which rapidly form large colonies on nutrient agars, such as potato dextrose or malt extract dextrose-peptone. *U. striaeformis* has hitherto given no evidence of ability to pursue a saprophytic mode of existence. The sporidia are unisexual and fusion takes place within a few hours on non-nutrient agar, each fused pair giving rise to a long, vigorous aerial infection hypha. The results of mating experiments with twelve pedigreed monosporidial cultures of *U. bullata* [loc. cit.] and four of *U. striaeformis* showed that the sporidia of the two species are highly compatible, and that the greater number of infection hyphae produced by certain combinations always involved the same sex group of *U. striaeformis*.

In inoculation experiments by the partial vacuum method [ibid., xvi, p. 737] with aqueous suspensions of spores or sporidia of opposite sex, *U. striaeformis* caused more or less heavy infection (up to 100 per cent.)

on *A. caninum*, *A. cristatum*, *A. inerme*, *A. pauciflorum*, *A. smithii*, *A. subsecundum*, *A. semicostatum*, *A. spicatum*, *E. glaucus*, *E. canadensis* and its var. *robustus*, *E. sibiricus*, *Hordeum brevisubulatum*, *H. jubatum* and its var. *caespitosum*, *H. nodosum*, and *Sitanion hanseni*, of which *A. smithii*, *A. subsecundum*, *E. canadensis* var. *robustus*, *E. sibiricus*, *H. jubatum*, and *H. nodosum* are reported as new hosts of the stripe smut.

The new race of *U. striaeformis*, unlike those previously identified, appears to be seed-borne, only smutted plants being produced by seeds taken from infected individuals of *A. pauciflorum*. Of 34 selections and collections of this grass tested for reaction to the new race, only six gave any promise of utility as resistant or immune stock.

It is recommended that the new race should be known as *U. striaeformis* f. *hordei*, in keeping with the system of classification instituted by W. H. Davis [ibid., xv, p. 27] for physiologic races of the stripe smut. Notwithstanding the conspicuous differences between the new race and others in respect of spore germination, pathogenicity, culturability, sexuality, and seed transmission, the former is indistinguishable on the basis of spore morphology, and should thus probably not be accorded specific rank.

NICOLAS (G.) & AGGÉRY [BERTHE]. **Sur quelques Peronospora parasités par des bactéries.** [On some *Peronospora* species parasitized by bacteria.]—*Rev. Mycol.*, N.S., v, 1, pp. 14–19, 1940.

The conidiophores and conidia of *Peronospora trifoliorum* on material of *Trifolium incarnatum* kept in a damp chamber were found to be agglutinated into a brown, gelatinous mass and to contain large numbers of Gram-negative, rod-shaped bacteria, measuring 1·5 by 0·5 μ, and arranged singly or in pairs. The bacteria were present in all the cells, and particularly in the wood vessels, in the neighbourhood of the yellow spots on infected leaves; they passed into the mycelium, and infected and killed off the developing conidiophores and conidia. The relatively limited spread of the fungus in the field is attributed to this bacterial action.

Bacteria (of which a study has not yet been made) were also found in the mycelium, conidiophores, and conidia of *P. viciae* on vetch and *P. parasitica* on *Lepidium graminifolium*, conidial germination being reduced in each case by bacterial action.

ARK (P. A.) & THOMAS (H. E.). **Apple dieback in California.**—*Phytopathology*, xxx, 2, pp. 148–154, 2 figs., 1940.

Die-back of apple trees, often accompanied by a form of measles [*R.A.M.*, xviii, p. 785], premature death of the buds, and collapse of the bark above the ground with emission of a strong odour, giving rise to the local term of 'sour sap', and occasionally by cork and drought spot of the fruit, is stated to be prevalent in the Sebastopol district of California, where the soil is definitely acid and low in available nutrients, notably potassium. A certain amount of improvement followed the treatment of a few severely affected trees with heavy applications (25 or 75 lb. per tree) of potassium sulphate. Annuals such as nasturtium (*Tropaeolum majus*), sugar beet, and sunflower, grown in soil from affected orchards, developed boron-deficiency symptoms curable by the

incorporation with the soil of small quantities of borax or boric acid. Some indications were also obtained from small-scale experiments that the application of borax (up to 10 lb.) to the soil round apple trees for a radius of 3 ft. from the trunk exerted a beneficial effect on cases of combined cork [ibid., xix, p. 29] and measles, and in some instances of die-back alone.

MacArthur (Mary). **Histology of some physiological disorders of the Apple fruit.**—*Canad. J. Res.*, Sect. C, xviii, 1, pp. 26–34, 2 pl., 1 graph, 1940.

In this preliminary study conducted in Canada in 1938 of the histological effects of the boron-amenable disorders of apples, internal cork [*R.A.M.*, xix, p. 29], corky core [ibid., xiv, p. 592], drought spot [loc. cit.], and the non-boron-amenable disorder bitter pit [ibid., xviii, p. 118], it was found that in both groups starch retention is common in all types of necrotic areas and external papillations occur on the walls of cells in close proximity to the lesions. The first group shows also abnormal meristematic activities, giving rise to three types of abnormal cells, namely, (1) a cork cambium partially or completely walling off a lesion, (2) massed linear cells, heavily papillated, and (3) reactivated individual cells or groups of cells. All three types occur in internal cork and drought spot, and all except cork cambium in corky core. Blotchy pit [ibid., xvii, p. 688], macroscopically resembling bitter pit but with larger dark green lesions mottled with brown, was found to comprise two extreme types, (1) closely similar to internal cork has a discontinuous cambium defining the lesion, and abnormal linear tissue in the intercellular spaces and lacunae of collapsed cell groups, and (2) identical in appearance with bitter pit in which there is neither cambial activity nor abnormal growth. Intergrade types occur between these two extremes. Water core [ibid., xix, p. 29] shows neither cell collapse, starch retention, papillae, abnormal growth, nor cambial activity and cannot be placed in either of the two groups of disorders.

Keitt (G. W.). **Toxicity of the sodium salts of dinitro-o-cresol to Venturia inaequalis.**—*Science*, N.S., xc, 2328, pp. 139–140, 1939.

Continuing his earlier investigations [*R.A.M.*, xvii, p. 118] the author, in the spring of 1938, carried out small-scale experiments in which overwintered apple leaves bearing abundant, mature ascospores of *Venturia inaequalis* were sprayed with elgetol, a proprietary preparation containing 12 per cent. by weight of the sodium salt of dinitro-o-cresol with the addition of a supplement to facilitate penetration. Similar leaves sprayed with water served as controls. The results obtained indicated that elgetol in water at a concentration of 1 per cent. by volume reduced ascospore discharge (average of three trials) by 99·7 per cent. Other tests [cf. ibid., xvii, p. 121] indicated that the lethal concentration of elgetol to the two isolates of *V. inaequalis* tested was approximately 0·05 per cent. by volume.

Bratley (C. O.). **Development of scab on stored Apples, 1938–1939.**—*Phytopathology*, xxx, 2, pp. 174–178, 1 fig., 1940.

In February, 1939, several lots of apples from Pennsylvania, New

Jersey, Massachusetts, and the Hudson Valley of New York on the New York City market were observed to bear the characteristic storage type of scab [*Venturia inaequalis*] lesions, those on Stayman Winesap, Baldwin, and Stark being $\frac{1}{8}$ to $\frac{1}{4}$ in. in diameter and jet-black, while the dark brown spots on Rome Beauty measured less than $\frac{1}{16}$ in. Many lots of Stayman Winesap and Rome Beauty originating in eastern Pennsylvania picked and stored during the first three weeks of October showed 80 to 90 per cent. infection, whereas McIntosh and Delicious from the same orchard, gathered a month earlier, were scab-free. The final spray application in the affected orchards was given during the first week of July. Information from other north-eastern fruit-growing areas corroborated these data as regards the susceptibility to late scab of October-picked fruit. Previous experiments by the writer having shown the importance of protracted moisture in the development of the disease [*R.A.M.*, xvii, p. 118], an attempt was made to correlate the present outbreak with late summer (1938) weather conditions in the north-east, and it was ascertained that heavy rain fell daily from 17th to 21st September, preceded by intermittent rains from the 12th onwards, thus affording ideal conditions for the growth of the fungus. The only area (Rochester, New York) escaping abnormal precipitation was likewise free from an excessive incidence of scab.

Cooley (J. S.) & Davidson (R. W.). **A white root rot of Apple trees caused by Corticium galactinum.**—*Phytopathology*, xxx, 2, pp. 139–148, 4 figs., 1940.

In 1932, *Corticium galactinum* [*R.A.M.*, vii, p. 176; xviii, p. 321], no mention of which could be traced in phytopathological literature since 1909, was observed as an active parasite of apple roots in Virginia, and it has subsequently been found in Maryland, Tennessee, Delaware, and Indiana, occurring exclusively in orchards planted on new land or adjoining woods. Infection usually originates at the collar or on the larger roots and spreads rapidly outwards on the smaller ones, causing the sudden death of the whole tree, often without any premonitory aerial symptoms. The white hyphal strands on the root surface develop into a dense weft of mycelium which gradually penetrates the epidermis, cortex, cambium, and wood. The cambium is not uniformly destroyed, growth and enlargement of the tissues surrounding the killed areas sometimes taking place and resulting in the formation of pits and bumps over the root surface; in other cases there may be general hypertrophy of the root at the junction of the diseased and healthy parts. Although the course of infection on individual trees is so rapid, its advance from tree to tree and from one orchard to another appears to be relatively slow.

Young apple trees were successfully inoculated with naturally diseased roots and pure cultures of the fungus, dug and stored seedlings being much more susceptible than those infected *in situ*. Other plants contracting infection by *C. galactinum* in the vicinity of diseased apple trees included *Rubus alleghaniensis*, *R. flagellaris*, *R. phoenicolasius*, dogwood (*Cornus florida*), sumac (*Rhus glabra*), and white campion (*Lychnis alba*). Recently the disease was also observed in an ornamental planting close to an oak stump near Hyattsville, Maryland,

necessitating the removal of a young holly, a dogwood, and two *Kalmia* bushes.

In the main, the light to ochraceous-buff fructifications of *Corticium galactinum* on apple roots agree with Burt's description in the Thelephoraceae of North America XV [ibid., vi, p. 125], except that he does not mention the conspicuous paraphyses, projecting up to 12 μ above the surface of the hymenium and penetrating the subhymenium to a depth of 30 to 40 μ. The optimum temperature for development was found to be between 25° and 31° C. and the maximum just above 34°.

SAKIMURA (K.). **Thrips nigropilosus Uzel, a non-vector of the yellow spot virus.**—*J. econ. Ent.*, xxxii, 6, p. 883, 1940.

After stating that yellow spot [of pineapple] is probably a synonym of spotted wilt (the evidence for which view is being given in a forthcoming paper) the author presents data obtained in experiments in Hawaii in which adults of *Thrips nigropilosus* and *T. tabaci*, bred on yellow spot-affected *Emilia sonchifolia*, potato, eggplant, and *Datura stramonium* plants, were transferred to a number of susceptible test plants. It may safely be concluded that *T. nigropilosus* is not a vector because not one out of a total of 668 individuals of *T. nigropilosus* transmitted the virus, which was, however, transmitted by *T. tabaci* from the same or similar infected plants.

In preliminary transmission experiments, 250 adult *Hercinothrips femoralis* from infected *E. sonchifolia* and celery were unable to transmit the virus.

MULLER (H. R. A.). **Overzicht van de belangrijkste Mangga-ziekten in Nederlandsch Indië.** [Survey of the most important Mango diseases in the Dutch East Indies.]—*Meded. alg. Proefst. Landb., Batavia*, 40, 9 pp., 1940. [English summary.]

Mangoes are liable to infection in the Dutch East Indies by *Rhizoctonia* [*Corticium*] *solani*, causing damping-off of seedlings; anthracnose (*Gloeosporium mangiferae*) [*Glomerella cingulata*: *R.A.M.*, xiv, p. 518; xviii, p. 750], attacking seedlings, nursery plants, and the leaves, twigs, inflorescences, and fruits of older trees; bark canker (*Physalospora* sp.); and *Botryodiplodia theobromae* [ibid., xvii, p. 331], occurring only as a wound parasite on trees damaged, e.g., by sun scorch, tar, or tanglefoot.

C. solani may be combated by soil treatment with ceresan (5 l. of a 1 in 5,000 solution per sq. m.) and spraying the seedlings with 1·5 per cent. Bordeaux mixture; *P.* sp. and *B. theobromae* by excision of the diseased cortex and the application to the wounds of a mixture of 92 per cent. hard paraffin wax and 8 per cent. carbolineum plantarium; and *G. cingulata* by regular spraying with Bordeaux mixture.

POLYAKOFF (I. M.). Новый протравитель комплексного действия. [A new fungicide of complex action.]—*Bull. Pl. Prot., Leningr.*, *1939*, 1, pp. 60–72, 1939.

In extensive field tests with condensat [*R.A.M.*, xviii, p. 605] conducted during 1937 to 1939 on a large number of collective farms in different parts of the U.S.S.R., the fungicide was found to be equally effective in controlling wheat bunt [*Tilletia caries* and *T. foetens*] and

smuts of cereals [*Ustilago* spp.] in all varieties and in all the localities tested, whether applied by the wet or the semi-dry method and either by hand or machine. It can also be used in combination with vernalization. For the control of bunt and smuts concentrations of condensat equivalent to 0·1 per cent. of formaldehyde, applied in the same way as formalin, are recommended.

In a field test with cotton, solutions of condensat containing 0·1 per cent. formaldehyde reduced the amount of gummosis [*Bacterium malvacearum*: ibid., xvii, p. 815] infection in bolls, leaves, and stems to 2·8, 24·2, and 27·1 per cent., respectively, as compared with 56·7, 76·4, and 95·5 per cent. for the untreated control and 7·6, 49·2, and 49·5 per cent. for plants treated with formalin; both condensat and formalin depressed germination very slightly.

In laboratory tests with cabbage diseases, *Plasmodiophora brassicae* and *Alternaria brassicae* were killed after five minutes exposure to solutions of condensat containing 0·5 per cent. formaldehyde, and *Moniliopsis aderholdi* by exposure to a solution of half this strength. Disinfecting the soil with aqueous solutions of condensat containing 0·5 per cent. formaldehyde at the rate of 1 : 8 by volume of soil completely controlled *M. aderholdi*, while a solution containing 2 per cent. formaldehyde applied at the same rate was effective against *P. brassicae*, the untreated control giving 70 to 100 per cent. infection. Soil disinfection had no adverse effect on seed germination and the growth of the plants.

MANIL (P.). **À propos de l'appréciation de l'activité des produits fongicides.** [On the estimation of the activity of fungicides.]—*Bull. Inst. agron. Gembloux*, viii, 3–4, pp. 215–222, 1939. [Flemish, German, and English summaries.]

After briefly discussing the desirability of devising some standard test for estimating the anti-parasitic activity of fungicides the author describes laboratory experiments which showed that the relative effectiveness of different materials tested may prove widely different according to the method of testing adopted [*R.A.M.*, xviii, p. 753]. For example, when phenol, mercuric chloride, and uspulun were tested against *Aspergillus niger* and *Penicillium glaucum*, it was found that the minimal antiseptic dosages were much higher on beer wort agar than in liquid beer wort, the phenolic coefficients also differing on the two media, while in another experiment when the same three materials were tested against spore suspensions, it was found that the minimal dosages required to kill the spores of both fungi in one hour were considerably higher than those inhibiting growth on liquid or solid media.

Specialpraeparater til Bekaempelse af Plantesygdomme og Skadedyr anerkendte af Statens Forsøgsvirksomhed. Gyldig for Aaret 1940. [Special preparations for the control of plant diseases and pests recognized by the State Experiment Service. Valid for the year 1940.]—*Tidsskr. Planteavl*, xliv, 3, pp. 486–495, 1940.

This is a list of proprietary plant protectives, officially tested and approved for 1940 by the Danish State Experiment Service, with the appropriate concentrations for use against various well-known diseases and pests [cf. *R.A.M.*, xviii, p. 332].

Rittenberg (S. C.). **Investigations on the microbiology of marine air.**—*J. mar. Res.*, ii, 3, pp. 208–217, 1939 (issued January, 1940).

The micro-organisms occurring in the air over an area off the Pacific Coast ranging from Cedros Island to Monterey, and from the mainland to 400 miles at sea, were studied during 1938–9 by exposing Petri dishes containing nutrient media to the atmosphere on board the research vessel *E. W. Scripps* (Scripps Institution of Oceanography, University of California). Moulds were the predominant group of organisms [cf. *R.A.M.*, xviii, p. 44], representing over 50 per cent. of the population, distributed among the following genera: Actinomycetes (2), *Alternaria* (6), *Aspergillus* (2), *Catenularia* (1), *Cephalosporium* (7), *Cladosporium* (7), *Helminthosporium* (7), *Hormodendrum* (15), *Macrosporium* (2), *Penicillium* (18), *Plenozythia* (1), *Spicaria* or *Paecilomyces* (1), *Sporotrichum* (7), *Stemphylium* (3), and *Trichoderma* (1). Most of these are common soil forms and their numbers diminished with increasing distance from the shore.

Jacobs (W. C.). **A discussion of physical factors governing the distribution of microorganisms in the atmosphere.**—*J. mar. Res.*, ii, 3, pp. 218–224, 1939 (issued January, 1940).

Discussing the relation of physical factors to the distribution of micro-organisms in the atmosphere with reference to Rittenberg's data on the incidence of moulds off the coast of California [see preceding abstract], the writer points out that the average count per hour for the region from 0 to 100 miles distant from land is 155·6 compared with only 29 at 100 to 400. As regards the origin of the fungi, the prevailing winds in southern California are from the sea, so that if the moulds under observation were primarily of land origin, they must either have been borne eastwards from the far removed territories bordering the North Pacific Ocean on the west or north, or been transported from the United States westwards across the prevailing wind stream through lateral mixing. The horizontal distance over which the individual organism may be conveyed is almost limitless, being largely determined by ability to survive the atmospheric environment.

Wishart (J.). **Field trials: their lay-out and statistical analysis.**—36 pp., 5 figs., Cambridge, Imperial Bureau of Plant Breeding and Genetics, 1940. 2*s.* 6*d.*

In this publication the author clearly explains, with numerous examples, how the reliability of field trials with different lay-outs can be estimated by statistical analysis of the data obtained, the points covered including the measurement of experimental error, the method of randomized blocks, analysis of variance, the Latin square, multiple factor experiments, the split plot, 'confounding', and breeding experiments with large numbers of varieties.

Edson (H. A.) & Wood (Jessie I.). **Crop losses from plant diseases in the United States in 1938.**—*Plant Dis. Reptr, Suppl.* 118, pp. 85–118, 1939 (issued March, 1940). [Mimeographed.]

Tables are given showing the estimated reductions from fungal, bacterial, virus, and other diseases of fruit, vegetable, cereal, tomato,

and tobacco crops in the United States in 1938 [cf. *R.A.M.*, xviii, p. 405].

NAOUMOFF (N. A.). О новых заболеваниях растений, вызываемых новыми или малоизвестными грибами. [On new diseases of plants caused by new or little known fungi.]—*Sovetsk. Bot., 1939,* 8, pp. 75–84, 1939.

Discussing the possible sources of new diseases, such as natural migration of the parasitic fungi, their introduction by man on infected plants or seeds, and the development of new forms by mutation, the author furnishes interesting short histories of the spread of some pathogens, accompanied in some cases by tables showing the chronological order of first appearances of a given fungus in different countries. A list is presented of rare or new fungi found between 1934 and 1938 in the Leningrad State University preserve in the Kursk district, including *Cercosporella piri* on pear. It is pointed out that host plant and pathogen may have the same or different countries of origin and accordingly a distinction is made between 'synpatrial' and 'heteropatrial' parasites.

KAUSCHE (G. A.). **Untersuchungen zum Problem der biologischen Charakterisierung phytopathogener Virusproteine.** [Studies on the problem of the biological characterization of phytopathogenic virus proteins.]—*Arch. ges. Virusforsch.*, i, 3, pp. 362–372, 12 figs., 1940.

This paper, presented at the Seventh International Congress of Genetics, held in Edinburgh in 1939, is a summary and critical discussion of the latest contributions towards the solution of the problems surrounding the nature of phytopathogenic viruses, including those of the writer and Stubbe on the tobacco mosaic mutants arising as a sequel to X-ray irradiation [*R.A.M.*, xix, p. 46], experiments with which are still in progress. In the author's view, there is no justification at present for an identification of the virus proteins with gene molecules, the latter being fundamental prerequisites for the manifestation of any biological properties, whereas the former are the product of infection on the normal albumin metabolism of the plant organism and the result of an autocatalytic synthesis having to be renewed exogenously for each individual. The most that can be said is that there are certain experimentally established analogies between virus proteins and genes which encourage the further study of the macromolecules of the former in relation to the problem of the biological characterization of both elementary units.

RAWLINS (T. E.) & TOMPKINS (C. M.). **Carborundum for plant-virus inoculations.**—*Phytopathology*, xxx, 2, pp. 185–186, 1940.

Powdered carborundum, 600-mesh, suitable as an abrasive in plant virus inoculations [*R.A.M.*, xv, p. 737], is stated to be available in any quantity from the Braun-Knecht-Heimann Company, San Francisco, who stock the product under the number 38713. On arrival the product should be placed in a dry heat sterilizer at 80° to 90° C. for as long as

is necessary to remove all superfluous moisture (which causes aggregation of the particles) and stored in tight-stoppered receptacles.

VOROBIEVA (Mme M. N.). Азотистый обмен у растений при вирусных заболеваниях. [Nitrogen exchange in plants infected by viruses.]—*Bull. Acad. Sci. U.R.S.S., 1939,* Sér. biol., 6, pp. 1103–1115, 1939. [English summary.]

Under southern Russian conditions degeneration of potatoes is stated to be correlated with early planting and probably due to high temperatures, and it was found by experiments in Moscow during 1936–7 that potatoes planted in summer differed little from the normal in appearance and chemical metabolism, while those planted in spring showed an increase in ammoniacal and amide nitrogen both in the tubers and green parts. This increase was also witnessed in plants grown from degenerated tubers under glass at temperatures lower than those prevailing in southern Russia. Similar increases were detected in potato tubers subjected to artificial heating and also in the plants developing from such tubers. Potatoes attacked by rugose or aucuba mosaics also showed an increase in ammonia nitrogen but little increase, or even a decrease, in amide nitrogen [cf. *R.A.M.*, xvi, p. 707; xix, p. 39]; as compared with a value of 100 for tubers and green parts of healthy Epicure potatoes, the amounts of ammonia nitrogen in early sown ones and those affected with rugose mosaic were 242·2 and 220·5 in tubers and 124·8 and 140·1 in green parts, respectively, the corresponding figures for amide content being 124·9 and 108·1 and 142·0 and 94·6, respectively. Similarly, with Hollander potatoes the ammonia nitrogen values in aucuba-diseased tubers and green parts were 111·5 and 118·5, respectively, and those of amide nitrogen 58·2 and 36·7, respectively, the values for healthy plants being 100. The nitrogen metabolism of tobacco plants artificially infected with the tobacco mosaic virus varied: the susceptible *Nicotiana tabacum* vars. *macrophylla*, *chinensis*, and Havana showed a gradually rising increase in the amount of protein, while the resistant *N. glutinosa* and *N. rustica* showed a decrease. The contents of ammoniacal and amide nitrogen in infected tobacco plants exhibited great irregularity, following apparently no rules.

GOSS (R. W.). **A dry rot of Potato stems caused by Fusarium solani.**—*Phytopathology*, xxx, 2, pp. 160–165, 1 fig., 1940.

A disease of Bliss Triumph potatoes in Nebraska and North Dakota, involving a dry, shredded rot of the underground stem and destruction of the roots with consequent aerial wilting (or, under high soil moisture conditions, rosetting and purpling of the foliage and aerial tuber formation), was found to be due to a strain of *Fusarium* (No. 242) morphologically similar to *F. solani* and provisionally identified with this species. The typical symptoms of the trouble were induced either by stem inoculation or the cultivation of plants in sterilized or unsterilized infected soil, the causal organism being recovered from any of the discoloured or rotted tissues. Comparative inoculation tests showed *F. solani* to be more virulent on potatoes than *F. oxysporum* or *F. avenaceum*, but less so than *F. solani* var. *eumartii* [*R.A.M.*, xviii,

p. 52], the following being the amounts of infection obtained: stem inoculations on ten plants with *F. avenaceum*, *F. oxysporum*, *F. solani* var. *eumartii*, and *F. solani* No. 242, 4, 8, 10, and 8, respectively; sterilized soil inoculated, 6 out of 29, 5 out of 18, 20 out of 20, and 27 out of 27, respectively; unsterilized soil inoculated, 9 out of 24 and 11, 25, and 20, respectively, out of 25. It will be seen that *F. solani* produced almost as high an incidence of infection as its var. *eumartii*, but without aerial wilting. Other potato isolates morphologically similar to *F. solani*, as well as a strain of *F. solani* from squash, proved to be non-pathogenic to potato plants and only weakly so to the tubers. *F. solani* was found to be capable of acting as a wound parasite on potato tubers, but not of attacking them through the stolons. In culture the optimum temperature for the fungus was 30° C., good growth also being made at 35°, but little at 10° and none at 5°.

EDDINS (A. H.). **Potato seed-piece rot caused by Fusarium oxysporum.**—*Phytopathology*, xxx, 2, pp. 181–182, 2 figs., 1940.

Fusarium oxysporum, isolated from decaying potato seed pieces [see preceding abstract] at the Florida Agricultural Experiment Station, where it has been present since 1934, but caused appreciable loss (10 per cent. and upwards) only in 1936, was shown by inoculation experiments to be pathogenic. In one series, pure cultures of the fungus on squares of potato dextrose agar were applied to the cut surfaces of seed pieces, which were then planted, together with uninoculated material, in sterilized soil. On removal 28 days later, all the inoculated pieces were partly or wholly decayed and had either not germinated or produced only weak sprouts, whereas the uninfected controls were healthy and vigorous. In another series, 25 inoculated and 25 uninoculated seed pieces from the same tubers were planted in rows in which one ton of fertilizer per acre had been distributed a fortnight earlier. A month later all the inoculated and 14 of the uninoculated pieces were in process of rotting and yielded *F. oxysporum.*

DOWSON (W. J.). **Identity of the bacterium causing Potato blackleg.**—*Nature, Lond.*, cxlv, 3668, p. 263, 1940.

From potato plants affected with blackleg the author isolated an organism which produced acid and gas in maltose and characteristic blackening when inoculated into the stem of living potato plants; in comparative studies, a soft-rotting organism isolated from carrots produced only wilting upon inoculation, and failed to form acid in maltose [cf. *R.A.M.*, v, p. 407; x, p. 125]. The blackleg organism is, therefore, apparently not identical with what is generally accepted as *Bacterium carotovorum* [*Erwinia carotovora*], and the author names it *Bact. phytophthorum* (Appel) n. comb. [cf. ibid., xvi, p. 302; xix, p. 117].

METZGER (C. H.) & GLICK (D. P.). **A promising method for eradicating bacterial wilt and ring rot from the Potato.**—*Amer. Potato J.*, xvii, 2, pp. 45–53, 1940.

In 1939 the writer carried out trials at the Mountain Substation (Minturn) of the Colorado Agricultural Experiment Station to determine the applicability to the elimination of bacterial wilt and ring rot

(*Pseudomonas sepedonica*) [*Bacterium sepedonicum*: *R.A.M.*, xix, p. 299] of the following method of microscopic examination of tuber and stem smears. Nineteen lots of the nine standard varieties for the State, viz., Bliss Triumph, Chippewa, Irish Cobbler, Katahdin, Red McClure, Rural New Yorker, Russet Burbank, Russet Rural, and White Rose were secured from sources believed to be nearly free from infection, the tubers dipped in a solution of semesan bel, cut through the stem end, and all showing vascular discoloration (21 per cent.) discarded. From each of those remaining a segment comprising a portion of the vascular ring was cut and pressed against a smeared slide to leave an imprint, the tuber being again dipped in semesan bel to disinfect the cut surface. The smears were heated in a flame and stained by the Gram method, using the modification of Racicot *et al.* [ibid., xviii, p. 201]. Of the 1,684 smears microscopically examined under an oil-immersion objective, representing 421 tuber units and 14 lots, 5 per cent. exhibited micro-organisms, resulting in the rejection of 11 per cent. of the units. An additional lot of 714 stem smears from a field of the Peachblow variety was apparently free from infection. If it is only possible to investigate one type of smear, that made from the stem base is believed to be a more reliable index of bacterial invasion than that derived from the tuber.

Meyer (C.). **Eenige resultaten van proeven en waarnemingen over het optreden van Aardappelschurft.** [Some results of experiments and observations on the occurrence of Potato scab.]—*Tijdschr. PlZiekt.*, xlvi, 1, pp. 19–29, 1940.

This is a summary of the outstanding results so far obtained in investigations on potato scab (*Actinomyces scabies*) undertaken by the Dutch State Agricultural Experiment Station and to be described in fuller detail by the responsible authorities in a forthcoming publication. On certain soils, e.g., sand with not more than 5 per cent. humus, the hydrogen-ion concentration may be reduced to a level consistent with profitable yields by treatment with flowers of sulphur. Of the other inorganic fertilizers tested, slaked lime (2 to 36 tons per hect.), though it sometimes reduced the incidence of infection in the year of treatment, was quite unreliable and was furthermore apt to cause adverse after-effects. Among the organic manures, blood and fish meal (10 tons per hect.) were beneficial but too expensive. The most satisfactory of the chemicals tested in direct control experiments was mercuric chloride when applied at the rate of 800 c.c. of a solution containing 0·4 gm. per plant hole. Yellow mercuric oxide at the same strength also gave moderately good results, but not equal to mercuric chloride, and the price is higher. Aretan [*R.A.M.*, xix, p. 198] (4 gm.) gave good results in a test on sandy clay, but seems to be less reliable than mercuric chloride at a much lower strength. Brassicol [ibid., xvi, p. 653] also proved effective at the rate of 6 gm. per plant hole, but its exorbitant cost and high lime content are great disadvantages. Calomel [mercurous chloride] acted similarly to mercuric chloride at the same strength, but is dearer and, being insoluble, less easily applied. Formalin proved unreliable. Germisan acted favourably at the rate of 2·5 gm. per plant hole, but is too expensive, and the same applies to ferric chloride at 20 gm.

HEMMI (T.) & IMURA (J.). **On the relation of air-humidity to conidial formation in the rice blast fungus, Piricularia oryzae, and the characteristics in the germination of conidia produced by the strains showing different pathogenicity.**—*Ann. phytopath. Soc. Japan*, ix, 3, pp. 147–156, 1939. [Japanese, with English summary.]

When rice seedlings were sprayed with a conidial suspension of *Piricularia oryzae* [*R.A.M.*, xviii, p. 546] and placed, as soon as the leaves showed the characteristic spotting, in desiccators in which the air was kept at constant humidities, it was ascertained that the fungus is able to produce conidia in the spots in air of 93 per cent. or more relative humidity. At 89 to 90 per cent. relative humidity, conidial production was scanty, while at 88 per cent. it was absent. The percentage of germinated conidia and the length of the germ-tubes produced did not appear to be correlated with differences in the pathogenicity of various strains, but a strain of the strongest pathogenicity showed more tendency than did a strain of the weakest to produce two germ-tubes from a single conidium.

AKAI (S.). **On the ash figures of the leaves of the Rice plants transplanted from the different kinds of nursery beds and their susceptibilities to the blast disease.**—*Ann. phytopath. Soc. Japan*, ix, 4, pp. 223–235, 1939. [Japanese, with English summary.]

In Japan, mature rice plants transplanted from the nursery beds at the seedling stage show different degrees of susceptibility to blast (*Piricularia oryzae*), plants originating from wet nursery beds being more resistant than those from dry. It was concluded from a comparison of the ash figures for leaves of rice plants [*R.A.M.*, xvii, p. 622] from these two kinds of beds that the number of silicated epidermal cells (especially of the bulliform cells) per unit area was greater in plants from the humid than in those from the arid beds. Bulliform cells are more easily penetrated by the fungus than the long and short cells, and it is possibly significant that the number of silicated bulliform cells varies in accordance with these different conditions in the seedling stage.

SUZUKI (H.). **Influence of physical and chemical factors upon the formation of appressoria in the conidia of Piricularia oryzae. I. Influence of oxygen.**—*Jap. J. Bot.*, x, 3, pp. 321–324, 1 pl., 1939.

The author describes experiments to determine the influence of oxygen on appressorium formation by the conidial germ-tubes of *Piricularia oryzae* [see preceding abstracts] in drops of glucose solution placed on pieces of cellophane. The minimum oxygen concentration for conidial germination was found to lie between 0 and 5 per cent., and for appressorial formation between 10 and 15 per cent.

YABUTA (T.) & HAYASHI (T.). **Biochemical studies on bakanae fungus of the Rice. Part III. Studies on physiological action of gibberellin on the plant.**—*J. agric. chem. Soc. Japan*, xv, 4, pp. 403–413, 16 figs., 2 graphs, 1939. [Japanese, with English summary in *Bull. agric. chem. Soc. Japan*, xv, 4, pp. 82–83, 1939.]

After ten days in a water culture solution containing 0·14 to 3·5 mg. gibberellin (the active principle of the 'bakanae' fungus of rice [*Gib-*

berella fujikuroi: *R.A.M.*, xviii, p. 707]), young shoots of barley, buckwheat, *Phaseolus radiatus* var. *typicus*, rape seed, *Luffa cylindrica*, tomato, cucumber, cucurbit, and morning glory [*Ipomoea* (?) *nil*] showed abnormal elongation similar to that observed in infected rice. The same effects were induced by the injection of an aqueous solution of the stimulant into cucumber, cucurbit, *I.* (?) *nil*, soy-bean, and *P. angularis*, and by its application, mixed with lanoline, to the basal shoots of cucumber.

MARTIN (A. L.). **The effects of magnesium and calcium on 'white tip' of Rice.**—*Amer. J. Bot.*, xxvi, 10, pp. 846–852, 2 figs., 6 graphs, 1939.

During the mid-season and late growing periods in Texas rice is frequently affected by a physiological disorder ('white tip'), in which white, chlorotic areas appear at the tips of one or more of the new leaves. When the condition has reached a more advanced stage, the chlorotic area spreads and usually affects about half the leaf, the leaf tip drying up to a distance of half an inch or more. When the flag leaf is affected, the panicle sheath remains tightly rolled, the head being compressed on emerging from the boot. Often, the sheath is so tightly twisted that the head emerges through the side, and the few flowers borne on heads emerging in this way are often sterile, or give distorted grains, with resultant decrease in yield.

When rice plants were grown in soil and water cultures low in magnesium similar symptoms developed, though the condition was eliminated when 81 and 27 p.p.m. of magnesium were added to the two types of cultures, respectively. Toxic effects were, however, produced, normal plants being obtained only when calcium was also supplied.

In the soil cultures, calcium was not toxic in low concentrations. In the magnesium-free water cultures 9 p.p.m. or more of calcium produced stunting and brown leaf-spotting, though these effects were no longer observed when sufficient magnesium was added. The best growth with absence of leaf injury occurred in culture solutions containing 27 p.p.m. each of magnesium and calcium. Cultures containing 81 and 243 p.p.m. of magnesium each plus 243 p.p.m. of calcium gave almost equally good results.

Boron in agriculture.—36 pp., 17 figs., 1 graph, London, Boron Agricultural Bureau, 1940.

This is a succinct, well-illustrated review of the best-known literature dealing with boron deficiency, the information given being arranged in three main sections, viz., agricultural crops, horticultural crops, and crops foreign to Great Britain. A bibliography of 112 titles is provided.

KEYWORTH (W. G.) & DAVIES (D. L. G.). **Hop diseases. A report of the preliminary investigations carried out in 1938 and 1939 on certain Hop diseases.**—Reprinted from *J. Kent Br. N.F.U.*, Dec. *1939*, and Jan. *1940*, 18 pp., 1940.

Much of the subject matter of this paper has already been noticed in this *Review*. In small-scale experiments conducted during 1939 on

the control of *Verticillium* wilt (*V. albo-atrum* and *V. dahliae*) [*R.A.M.*, xviii, p. 709] soil disinfection with formalin gave promising results; of the 11 commercial and 9 other hop varieties tested all proved equally susceptible to the disease. A survey of hop gardens affected with nettlehead [ibid., xviii, p. 817] showed that in 'square-plant' gardens the disease spreads in all directions, whereas in 'Worcester-plant' gardens it spreads to a much greater extent along the rows than across them. The mode of spread of the disease from one garden to another is not yet fully understood, but it is almost certainly introduced by the planting of infected sets. Other diseases included in this report are mosaic [ibid., xvi, p. 836], split leaf [ibid., xv, p. 462], from which none of the gardens visited during 1939 was entirely free, split leaf blotch, fluffy tip [ibid., xviii, p. 295], *Armillaria mellea* [ibid., xvi, p. 822], the outbreaks of which were found almost invariably associated with grubbing of trees from the affected area a year or two previously, small hop [ibid., xv, p. 462], and canker caused by *Fusarium sambucinum* [ibid., xviii, p. 760]. Two diseases of unknown origin were observed in some hop gardens, one characterized by a sometimes severe stunting of the hills, and the other, fairly common on Fuggle hops, by an interveinal scorching on the six or eight leaves in the middle of the bine, badly affected leaves often curling up and eventually dropping off.

Reese (E.). **Additions to the powdery mildew flora of Pennsylvania.**—*Proc. Pa Acad. Sci.*, xiii, pp. 70–75, 1939.

This is a critically annotated list of the powdery mildews of north-eastern Pennsylvania, supplementing the catalogue of Overholts and Campbell (1934) for the central part of the State. A table is given showing some of the dimensional variations between the writer's specimens and those of Salmon. Thus, the perithecia of *Uncinula salicis* [*R.A.M.*, xiii, p. 399] on willow (*Salix humilis*) and poplar (*Populus grandidentata*) in Pennsylvania measure 135 to 188 μ compared with 90 to 175 (average 135) μ as reported by Salmon; the asci number 6 to 16 instead of 8 to 14 and measure 32 to 47 μ in width in place of 30 to 40 μ. Other divergences include the following: *U. necator* on wild vine (Pennsylvania), perithecia 98 to 145 μ, 4 to 11 asci (usually 6 to 8) measuring 47 to 67 μ in length, compared with 70 to 128 (average 96) μ, 4 to 6, rarely 6 to 9, and 50 to 60 μ, respectively, for Salmon's specimens; *Podosphaera oxyacanthae* on *Prunus* spp. and other hosts (Pennsylvania), perithecia 77 to 121 μ, asci 54 to 87 by 40 to 67 μ, whereas Salmon's figures are 64 to 90 μ and 58 to 90 by 45 to 75 μ, respectively; *Sphaerotheca humuli* on strawberry, hops, and other plants (Pennsylvania), perithecia 80 to 129 μ in diameter, asci 73 to 108 μ in length, as against Salmon's measurements of 58 to 120 and 45 to 90 μ, respectively; *S. humuli* var. *fuliginea* on various wild hosts (Pennsylvania) had perithecia 67 to 121 μ, instead of 'smaller than *S. humuli*, down to 50 μ', as reported by Salmon; *Microsphaera alni* on alder (*Alnus incana*) and various other hosts (Pennsylvania) had perithecia 81 to 145 μ in diameter, as against 66 to 135 μ (Salmon) and *M. alni* var. *extensa* on red oak (*Quercus* sp.) (Pennsylvania), perithecia 118 to 151 μ in diameter, 11 to 21 appendages, and 3 to 5 asci, as against 90 to 140 (average 115) μ, 8 to 19, and 3 to 8, respectively (Salmon).

SĂVULESCU (T.). **Contribution à la connaissance des Urédinées de Roumanie.** [A contribution to the knowledge of the Uredineae of Rumania.]—*Bull. Sect. sci. Acad. roum.*, xxi, 3–4, pp. 1–11, 10 figs., 1939.

Three of the six rusts critically described in this paper [cf. *R.A.M.*, xvii, p. 556] are new to Rumania, two are new to science, and one is a new variety [the three latter being furnished with Latin diagnoses]. *Aecidium petroselini-sativi* n. sp., observed in June 1930 causing a spotting of parsley leaves in the Dobrudja, is characterized by hypophyllous, cupulate aecidia, 189 to 320 by 150 to 300 μ, consisting of rhomboid or irregular peridial cells, 24 to 38 by 9 to 18 μ (mostly 22 to 33 by 12 to 18 μ), with verrucose walls, and angular to globose, densely verruculose, subhyaline spores, 15 to 21 by 13 to 20 (17 to 18 by 15 to 18) μ.

DA CÂMARA (E [M]. DA S.) & DA LUZ (C. G.). **Mycetes aliquot Lusitaniae III.** [Some fungi of Portugal III.]—*Agron. lusit.*, i, 2, pp. 167–199, 4 pl., 1939.

This further instalment of the authors' annotated catalogue of Portuguese fungi [*R.A.M.*, xviii, p. 711] comprises some 90 species, of which ten are new and 37 additions to the known mycoflora of the country. Among the latter may be mentioned *Septoria agrestis* on wheat leaves, *Oidium cinarae* on leaves of *Tropaeolum majus*, *Erysiphe lichenoides* [*Oidiopsis taurica*] on stems of *Foeniculum vulgare*, and *Sphaeropsis mespili* on fruits of *Cotoneaster*, the last-named being queried as *S. malorum* Peck [the pycnidial stage of *Physalospora obtusa*].

VIENNOT-BOURGIN (G.). **Contribution á la connaissance de la mycoflore de l'Archipel de Madère.** [A contribution to the knowledge of the mycoflora of the Archipelago of Madeira.]—*Ann. Éc. Agric. Grignon*, Sér. 3, i (*1938–1939*), pp. 69–169, 6 pl., 21 figs., 1939.

In the second part of this paper the author gives a descriptive list of 153 parasitic fungi found by him on the archipelago of Madeira in 1936, and including 63 species of *Puccinia*, 26 of *Uromyces*, 8 of *Rostrupia*, 8 of *Tilletia*, and 5 of *Ustilago*. Of these fungi the following may be mentioned: *Kuhneola* [*Cerotelium*] *fici* [cf. *R.A.M.*, xvi, p. 207] on fig; *Puccinia allii* on *Allium ampeloprasum*; *P. antirrhini* on *Antirrhinum majus*; *P. iridis* (in the uredo stage only) on cultivated *Iris*; *P. pruni-spinosae* (uredo stage only) occurred in numerous localities on plum; *Uromyces fabae* on broad bean; *Entyloma dahliae* on *Dahlia*; *Ustilago cynodontis* on *Cynodon dactylon*; *Polythrincium* [*Dothidella*] *trifolii* on *Trifolium ligusticum*; *Septoria petroselini* on parsley; and *Gnomonia veneta* on *Platanus occidentalis*, causing considerable damage. Vines were almost everywhere attacked by *Plasmopara viticola* and showed severe infection by *Uncinula necator*.

MARTIN (G. W.). **Outline of the fungi.**—*Univ. Ia Stud. nat. Hist.*, xviii, 1, pp. 1–40, 1940.

This is a revision of the writer's 'Key to the families of fungi, exclusive of the lichens' [*R.A.M.*, xvi, p. 341].

Jenkins (Anna E.) & Bitancourt (A. A.). **Illustracões das doenças causadas por «Elsinoë» e «Sphaceloma» conhecidas na America do Sul até Janeiro de 1936.** [Illustrations of the diseases caused by *Elsinoe* and *Sphaceloma* known in South America up to January 1936.]—*Arq. Inst. biol. S. Paulo*, x, pp. 31–60, 11 pl., 1939. [English summary.]

The 13 plant diseases due to species of *Elsinoe* and *Sphaceloma* recorded in South America up to January, 1936, are critically discussed and figured [*R.A.M.*, xvii, p. 70]. Poplar anthracnose (*S. populi*), originally reported by Spegazzini from Chile (*Rev. Fac. Agron.*, vi, p. 183, 1910) as *Hadrotrichum* (?) *populi* [ibid., xii, p. 661], also occurs in the Argentine [*R.A.M.*, xvi, p. 5] and Minas Geraes, Brazil.

According to a personal communication from Sydow to the first-named author, *E. amazonica* was found on *Iresine argentata* in Puerto Rico in 1886 and 1900, these records antedating its discovery in Peru.

Details are given of the distribution of avocado scab (*S. perseae*) in Brazil [ibid., xiv, p. 459], where the disease has spread rapidly since its introduction ten years ago. *E. veneta* on raspberry and *E. piri* on apple and pear [ibid., xiv, p. 223; xviii, p. 478] have only been observed in the Argentine, but rose anthracnose (*S. rosarum*) [ibid., xvii, pp. 69, 683], already known in both these countries, was also collected by A. S. Müller in Venezuela in 1937.

Specimens of *E. calopogonii* on *Calopogonium coeruleum* from other districts of Peru besides the locality providing the type species have recently been identified by Sydow.

The present position as regards the distribution of sour and sweet orange scab (*E. fawcetti* and *E. australis*) in South America [ibid., xvii, p. 595 *et passim*] is reviewed and the literature relating to these diseases critically discussed. Both fungi are present in Brazil, the Argentine, and Paraguay [ibid., xvii, p. 389], while *E. fawcetti* also occurs in Venezuela and *E. australis* in Uruguay, the hosts of the former including (besides the sour orange) sweet orange, *Citrus sinensis* × *C. nobilis*, *C. nobilis* var. *unshiu*, lemons, limes, pomelo, tangelo (*C. grandis* [*C. maxima*] × *C. nobilis*), and calamondin (*C. mitis*), and those of the latter (in addition to the sweet orange) tangerine, *C. nobilis* × *C. sinensis*, limes, *C. hystrix*, *Fortunella margarita*, *C. nobilis* × *C. paradisi*, *C. paradisi*, and *C. nobilis unshiu*.

A survey of the history of grape anthracnose (*E. ampelina*) in South America shows that the disease engaged the attention of viticulturists in Brazil [ibid., xvii, pp. 17, 726], the Argentine, Paraguay, and Chile, and possibly also in Uruguay, as early as 1881 to 1900, before the establishment of phytopathological laboratories in some cases.

S. terminaliae on *Terminalis catappa* has been reported from another locality in Brazil (Rio de Janeiro) in addition to the original record from São Paulo [ibid., xvii, p. 348]. *S. mattirolianum* on *Arbutus unedo* [ibid., xii, p. 661] is still known only from the Argentine, where it was discovered in 1931, but an atypical form of anthracnose of *Genipa americana* (*S. genipae*), previously observed in São Paulo [ibid., xvii, p. 349], has been reported from the Rio Grande del Norte, Brazil.

Five of the pathogens under discussion (*E. australis*, *E. amazonica*, *E. calopogonii*, *S. terminaliae*, and *S. genipae*) were first described from South America and of these all except *E. amazonica* are confined to it.

The quarantine measures that have been established to combat these diseases indicate the recognition of their economic importance and of the need for restricting their spread.

Pilát (A.). **Basidiomycetes chinenses a cel. Emilio Licentio in itineribus per Chinam septentrionalem annis 1914–1936 susceptis, lecti.** [Chinese Basidiomycetes collected by the Rev. Emil Licent in the course of his journeys through northern China undertaken during the years 1914 to 1936.]—*Ann. mycol., Berl.*, xxxviii, 1, pp. 61–82, 4 pl., 3 figs., 1940.

This is a critically annotated list of some 130 northern Chinese Basidiomycetes (including 75 Polyporaceae) collected by the Rev. E. Licent during the period from 1914 to 1936.

Guyot (A. L.). **Études experimentales sur les Urédinées hétéroïques realisées au laboratoire de botanique de l'École Nationale d'Agriculture de Grignon (Seine-et-Oise) au cours des années 1938–1939.** [Experimental studies on the heteroecious Uredineae carried out in the botanical laboratory of the National School of Agriculture of Grignon (Seine-et-Oise) during the years 1938–1939.]—*Ann. Éc. Agric. Grignon*, Sér. 3, i (*1938–1939*), pp. 58–68, 1939.

On 18th March, 1938, the author placed straw of *Melica ciliata* which had become infected by *Uromyces graminis* during the summer of 1937 in the Mediterranean region of France in contact with young plants of *Anethum foeniculum* [*Foeniculum vulgare*]. The first spermogonia appeared on 21st April, 1938, and a few mature aecidia were noted on 20th May. This result confirms the ability of *F. vulgare* to carry the aecidia of *U. graminis* in the locality mentioned.

In the course of an experimental study on the relation of the aecidia on *Euphorbia gerardiana* to *U. caryophyllinus* it was found that aecidiospores from the north of France and the vicinity of Paris were able to develop on a number of species of *Dianthus* (actively on *D. prolifer* and *D. sinensis*, moderately on *D. barbatus* and *D. deltoides*, and weakly on *D. monspessulanus* and *D. seguieri*), but there are many species of *Dianthus*, including the carnation (*D. caryophyllus*), which they appear to be unable to infect.

Artificial inoculations with aecidiospores of *U. pisi* taken from *Euphorbia cyparissias* [*R.A.M.*, xvii, p. 478] in various parts of northern France and of *U. fischeri-eduardi* from *E. cyparissias* [ibid., xv, p. 607] showed differences in the susceptibilities of various leguminous hosts to several strains of the rusts.

Van Beyma Thoe Kingma (F. H.). **Ueber einige Formen von Verticillium dahliae Klebahn.** [On some forms of *Verticillium dahliae* Klebahn.]—*Antonie van Leeuwenhoek*, vi, 1, pp. 34–47, 3 figs., 1940.

At the Centraalbureau voor Schimmelcultures, Baarn, the writer studied a number of pure cultures of *Verticillium* isolated from damp packing material at the Unilever Bacteriological Laboratory, Rotterdam, in comparison with the related *V. albo-atrum* Reinke & Berthold, *V. amaranti* Verona & Ceccarelli [*R.A.M.*, xiv, p. 765], *V. dahliae* Klebahn, *V. ovatum* Berkeley & Jackson [ibid., v, p. 564], and *V. tracheiphilum* Curzi [ibid., v, p. 206].

Wollenweber's opinion that *V. albo-atrum* is a widespread pathogen of a number of hosts [ibid., ix, p. 6] cannot be sustained on the basis of these investigations, which, on the contrary, stamp it as a rare parasite, mostly confined to potato and tomato. *V. dahliae*, on the other hand, is prevalent in nature on a wide range of hosts and comprises a variety of forms, including three new ones herein described [with Latin diagnoses] in addition to those previously assigned by Wollenweber to *V. albo-atrum* and now transferred to *V. dahliae* as new combinations. *V. albo-atrum* and *V. dahliae* differ markedly in cultural characters as well as in distribution, the former producing only a white, later dark-coloured resting mycelium tending to thicken into black knots without pseudosclerotia or chlamydospores, while the latter forms an abundance of chlamydospores, sometimes developing into pseudosclerotia, and its conidiophores, unlike those of *V. albo-atrum*, do not turn brown at the base. Species of *Verticillium* are clearly differentiated from those of *Cephalosporium* by their verticillate conidiophores, and therefore *C. serrae* [ibid., ix, p. 594] is transferred to *Verticillium* as *V. serrae* (Maffei) van Beyma n. comb. *V. dahliae* is envisaged as a 'group species' comprising a number of types and forms not entitled to specific rank. On this basis Wollenweber's varieties of *V. albo-atrum* are converted into forms of *V. dahliae*, *V. albo-atrum* Reinke & Berthold var. *chlamydosporale* Wr [ibid., ix, p. 6], becoming *V. dahliae* Kleb. f. *chlamydosporale* (Wr) van Beyma n. comb.; and *V. albo-atrum* var. *chlamydosporale* f. *angustum* Wr and *V. albo-atrum* var. *medium* Wr [loc. cit.] being changed into *V. dahliae* Kleb. f. *angustum* (Wr) van Beyma n. comb. and *V. dahliae* Kleb. f. *medium* (Wr) van Beyma n. comb., respectively. In agreement with G. H. Berkeley *et al.* [ibid., xi, p. 130], *V. albo-atrum* var. *caespitosum* Wr [ibid., ix, p. 6] is understood to be merely a variant of *V. albo-atrum* forming no pseudosclerotia in contradistinction to *V. dahliae*. *V. amaranti* forms intercalary chains of chlamydospores, like the *V. dahliae* group; it is identical with *V. serrae*. *V. tracheiphilum* and *V. ovatum* are stated to be identical with *V. dahliae*. *V. cinerescens* Wr [loc. cit.] is excluded from the genus *Verticillium* by reason of its fasciculate conidiophores and is placed in *Phialophora* as *P. cinerescens* (Wr) van Beyma n. comb.

The above-mentioned three new forms of *V. dahliae* are characterized by the following peculiarities: f. *zonatum* by the rapid production of chlamydospores which soon turn dark brown, and by the formation of well-defined zones in oatmeal and potato agar cultures; f. *cerebriforme* by its cerebriform colonies on beer wort agar and the development of chlamydospores in long chains; and f. *restrictum* by its cream-coloured, later faintly greyish-green colonies on beer wort agar and its circular to subglobose conidia, 3 to 3·3 by 2·3 to 2·7 μ.

TUNSTALL (A. C.). **Notes on root diseases of Tea in north east India.**—*Mem. Tocklai Exp. Sta. Indian Tea Ass.* 8, 25 pp., 11 pl. (6 col.), 1940.

The main object of this paper is stated to be to help planters in north-eastern India to distinguish root diseases of tea caused directly by a parasitic fungus from those in which the organism is secondary. Only two diseases of each group are described in detail, charcoal stump rot (*Ustulina zonata*) and brown root rot (*Fomes lamaoensis*) [*R.A.M.*,

x, p. 345] representing the first type, and violet root rot (*Sphaerostilbe repens*) [ibid., xvi, p. 1] and *Diplodia* or internal root disease (*Botryodiplodia theobromae*) the second [but see ibid., xvii, p. 71]. Practical recommendations are made for the control of both groups of disorders, in connexion with which it may be mentioned that the encirclement of diseased trees with shallow isolation trenches is no longer advocated, the removal of infected material being regarded as the sole reliable treatment.

Notes are also given on the following fungi associated with root rots in a primary (A) or secondary (B) capacity: A. Black root rot (*Rosellinia arcuata*) [ibid., xv, p. 610], *Kretzschmaria micropus*, a pathogen of rare occurrence, probably an aberrant form of *U. zonata* [ibid., viii, p. 611], *Hypoxylon asarcodes*, hitherto recorded only on a few specimens from the Jalpaiguri district and on one from the Assam Valley, *Armillaria mellea*, seldom observed locally, *Fomes lucidus* [*Ganoderma lucidum*], also uncommon in the north-east, red root rot (*Poria hypolateritia*), and *Helicobasidium compactum* [ibid., xii, p. 9], occasionally found attacking plants under five years old. B. An unidentified species of *Aglaospora*, distinct from *A. aculeata* [ibid., x, pp. 79, 760], *Rhizoctonia bataticola* [*Macrophomina phaseoli*: ibid., xiv, p. 561; xvii, p. 301], undetermined *R.* spp., one of which is associated with a stringy type of mycorrhiza peculiar to the Darjeeling district, *Auricularia auricula-judae* [ibid., vi, p. 127], *F. applanatus* [*G. applanatum*], *F. lignosus*, *P. hypobrunnea*, *Irpex destruens* [ibid., xii, p. 597], *I. subvinosus* [ibid., iii, p. 5], *Polyporus interruptus*, and *P. mesotalpae*, the four last-named occurring only sporadically in the north-east.

A key is given of the principal symptoms caused by the various fungi to assist diagnoses from an examination of the roots of dead bushes.

BITANCOURT (A. A.) & JENKINS (ANNA E.). **«Elsinoë theae n. sp.», agente da verrugose da Chá.** [*Elsinoe theae* n. sp., the agent of Tea scab.]—*Arq. Inst. biol. S. Paulo*, x, pp. 193–198, 2 pl., 1939. [English summary.]

Portuguese and Latin diagnoses are given of *Elsinoe theae* n. sp., the agent of a foliar scab of tea at Cantareira, São Paulo, Brazil, and also in Ceylon, where specimens were collected by T. Petch in 1917 and 1922 and by C. H. Gadd in 1939; the former described the symptoms in his 'Diseases of the Tea Bush' [*R.A.M.*, iii, p. 3] under the name of 'scabbed leaves'. The fungus, which forms on the leaves (mostly on the upper side) round, black, often confluent spots, 0·2 mm. in diameter, is characterized by pulvinate, intra-epidermal, pseudoparenchymatous ascomata, 200 to 300 by 15 to 18 μ; by asci usually forming an irregular single stratum, sometimes with thickened stalks or apices, 14 to 22 by 12 to 20 μ, containing eight hyaline, triseptate ascospores, the middle cells longitudinally septate and constricted in the centre, the upper and lower ones broader and shorter; and by numerous spherical, hyaline microconidia, 0·5 to 1 μ in diameter. On potato dextrose agar the fungus grows slowly, producing compact, convoluted, salient, cinnamon-coloured colonies which gradually assume a concentric aspect, the central zone being of a fawn tint, the next orange-cinnamon, and the peripheral army-brown.

Wollenweber's opinion that *V. albo-atrum* is a widespread pathogen of a number of hosts [ibid., ix, p. 6] cannot be sustained on the basis of these investigations, which, on the contrary, stamp it as a rare parasite, mostly confined to potato and tomato. *V. dahliae*, on the other hand, is prevalent in nature on a wide range of hosts and comprises a variety of forms, including three new ones herein described [with Latin diagnoses] in addition to those previously assigned by Wollenweber to *V. albo-atrum* and now transferred to *V. dahliae* as new combinations. *V. albo-atrum* and *V. dahliae* differ markedly in cultural characters as well as in distribution, the former producing only a white, later dark-coloured resting mycelium tending to thicken into black knots without pseudosclerotia or chlamydospores, while the latter forms an abundance of chlamydospores, sometimes developing into pseudosclerotia, and its conidiophores, unlike those of *V. albo-atrum*, do not turn brown at the base. Species of *Verticillium* are clearly differentiated from those of *Cephalosporium* by their verticillate conidiophores, and therefore *C. serrae* [ibid., ix, p. 594] is transferred to *Verticillium* as *V. serrae* (Maffei) van Beyma n. comb. *V. dahliae* is envisaged as a 'group species' comprising a number of types and forms not entitled to specific rank. On this basis Wollenweber's varieties of *V. albo-atrum* are converted into forms of *V. dahliae*, *V. albo-atrum* Reinke & Berthold var. *chlamydosporale* Wr [ibid., ix, p. 6], becoming *V. dahliae* Kleb. f. *chlamydosporale* (Wr) van Beyma n. comb.; and *V. albo-atrum* var. *chlamydosporale* f. *angustum* Wr and *V. albo-atrum* var. *medium* Wr [loc. cit.] being changed into *V. dahliae* Kleb. f. *angustum* (Wr) van Beyma n. comb. and *V. dahliae* Kleb. f. *medium* (Wr) van Beyma n. comb., respectively. In agreement with G. H. Berkeley *et al.* [ibid., xi, p. 130], *V. albo-atrum* var. *caespitosum* Wr [ibid., ix, p. 6] is understood to be merely a variant of *V. albo-atrum* forming no pseudosclerotia in contradistinction to *V. dahliae*. *V. amaranti* forms intercalary chains of chlamydospores, like the *V. dahliae* group; it is identical with *V. serrae*. *V. tracheiphilum* and *V. ovatum* are stated to be identical with *V. dahliae*. *V. cinerescens* Wr [loc. cit.] is excluded from the genus *Verticillium* by reason of its fasciculate conidiophores and is placed in *Phialophora* as *P. cinerescens* (Wr) van Beyma n. comb.

The above-mentioned three new forms of *V. dahliae* are characterized by the following peculiarities: f. *zonatum* by the rapid production of chlamydospores which soon turn dark brown, and by the formation of well-defined zones in oatmeal and potato agar cultures; f. *cerebriforme* by its cerebriform colonies on beer wort agar and the development of chlamydospores in long chains; and f. *restrictum* by its cream-coloured, later faintly greyish-green colonies on beer wort agar and its circular to subglobose conidia, 3 to 3·3 by 2·3 to 2·7 μ.

TUNSTALL (A. C.). **Notes on root diseases of Tea in north east India.**—*Mem. Tocklai Exp. Sta. Indian Tea Ass.* 8, 25 pp., 11 pl. (6 col.), 1940.

The main object of this paper is stated to be to help planters in north-eastern India to distinguish root diseases of tea caused directly by a parasitic fungus from those in which the organism is secondary. Only two diseases of each group are described in detail, charcoal stump rot (*Ustulina zonata*) and brown root rot (*Fomes lamaoensis*) [*R.A.M.*,

x, p. 345] representing the first type, and violet root rot (*Sphaerostilbe repens*) [ibid., xvi, p. 1] and *Diplodia* or internal root disease (*Botryodiplodia theobromae*) the second [but see ibid., xvii, p. 71]. Practical recommendations are made for the control of both groups of disorders, in connexion with which it may be mentioned that the encirclement of diseased trees with shallow isolation trenches is no longer advocated, the removal of infected material being regarded as the sole reliable treatment.

Notes are also given on the following fungi associated with root rots in a primary (A) or secondary (B) capacity: A. Black root rot (*Rosellinia arcuata*) [ibid., xv, p. 610], *Kretzschmaria micropus*, a pathogen of rare occurrence, probably an aberrant form of *U. zonata* [ibid., viii, p. 611], *Hypoxylon asarcodes*, hitherto recorded only on a few specimens from the Jalpaiguri district and on one from the Assam Valley, *Armillaria mellea*, seldom observed locally, *Fomes lucidus* [*Ganoderma lucidum*], also uncommon in the north-east, red root rot (*Poria hypolateritia*), and *Helicobasidium compactum* [ibid., xii, p. 9], occasionally found attacking plants under five years old. B. An unidentified species of *Aglaospora*, distinct from *A. aculeata* [ibid., x, pp. 79, 760], *Rhizoctonia bataticola* [*Macrophomina phaseoli*: ibid., xiv, p. 561; xvii, p. 301], undetermined *R.* spp., one of which is associated with a stringy type of mycorrhiza peculiar to the Darjeeling district, *Auricularia auricula-judae* [ibid., vi, p. 127], *F. applanatus* [*G. applanatum*], *F. lignosus*, *P. hypobrunnea*, *Irpex destruens* [ibid., xii, p. 597], *I. subvinosus* [ibid., iii, p. 5], *Polyporus interruptus*, and *P. mesotalpae*, the four last-named occurring only sporadically in the north-east.

A key is given of the principal symptoms caused by the various fungi to assist diagnoses from an examination of the roots of dead bushes.

Bitancourt (A. A.) & Jenkins (Anna E.). **«Elsinoë theae n. sp.», agente da verrugose da Chá.** [*Elsinoe theae* n. sp., the agent of Tea scab.]—*Arq. Inst. biol. S. Paulo*, x, pp. 193–198, 2 pl., 1939. [English summary.]

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Takahashi (W. N.). **An attempt to propagate Tobacco mosaic virus 1 in the chorio-allantoic membrane of the developing chick embryo.**—*Phytopathology*, xxx, 2, pp. 184–185, 1940.

The writer's attempts to propagate tobacco mosaic virus 1 in the chorio-allantoic membrane of the developing chick, a favourable medium for animal viruses, gave entirely negative results.

Kausche (G. A.) & Ruska (H.). **Die Struktur der „kristallinen Aggregate" des Tabakmosaikvirusproteins.** [The structure of the 'crystalline aggregates' of the Tobacco mosaic virus protein.]—*Biochem. Z.*, ccciii, 3–4, pp. 221–230, 6 figs., 1939.

It was concluded from studies with the Siemens ultramicroscope on an ammonium sulphate precipitate of tobacco mosaic virus protein that the crystal-like needle structures must be designated paracrystalline aggregates of crystalline molecules [*R.A.M.*, xviii, p. 44].

Price (W. C.). **Thermal inactivation rates of four plant viruses.**—*Arch. ges. Virusforsch.*, i, 3, pp. 373–386, 2 graphs, 1940.

Thermal inactivation of the tobacco necrosis, tobacco mosaic, lucerne mosaic, and tobacco ring spot viruses was found to follow the course of a first order reaction. The rates of inactivation, judged by infectivity on Black cowpeas for tobacco necrosis and ring spot, Early Golden Cluster beans (*Phaseolus vulgaris*) for lucerne mosaic, and *Nicotiana glutinosa* for tobacco mosaic, at a number of different temperatures were calculated for each of the four viruses, and the energy of activation (E) values computed from the resultant data in calories per mole. They were as follows: tobacco necrosis at 70° to 95° C., 37,300; tobacco mosaic in undiluted juice at 68° to 84° and 84° to 95°, 55,300 and 195,000, respectively; diluted 1 : 20 at 68° to 83° and 83° to 91°, 92,000 and 176,000, respectively; in dried White Burley leaf material at 70° to 150°, 24,100; lucerne mosaic at 50° to 62·5°, 75,000; and tobacco ring spot at 45° to 56·5° and 56·5° to 65°, 78,800 and 27,600, respectively.

Gowen (J. W.). **The size of the Tobacco mosaic particle from X-ray determinations.**—*Proc. nat. Acad. Sci., Wash.*, xxvi, 1, pp. 8–10, 3 graphs, 1940.

The evidence obtained from experiments in which the tobacco mosaic virus was exposed to X-rays indicated that the virus has a somewhat large molecule of 16 to 20 millions in molecular weight [*R.A.M.*, xviii, p. 763].

Silberschmidt (K.) & Kramer (M.). **A disseminação do mosaico do Fumo no campo.** [The dissemination of Tobacco mosaic in the field.]—*Arq. Inst. biol. S. Paulo*, x, pp. 61–72, 1 pl., 1 diag., 1 graph, 1939. [German summary.]

In 1938 three experimental plots, laid down at different levels at a distance of 10 m. apart, were each planted with 100 Virginia tobacco seedlings, the two rows of the highest alternating with two of 51 plants each of *Solanum reflexum*, artificially inoculated with mosaic [*R.A.M.*, xviii, p. 632], the intermediate being similarly arranged except for the omission of inoculation, and the lowest left with the tobacco only.

Infection spread in the first plot alone, the incidence on the tobacco increasing from 2·12 per cent. on 7th April to 12·76 on 28th July in a more or less uniform manner. The height, stem diameter, and number of fruits in a healthy and a diseased plant of *S. reflexum* were 0·87 m., 0·014 m., and 26, and 0·47 m., 0·007 m., and 4, respectively. The dissemination of the disease was evidently not materially furthered by flying insects, since the two other plots, only a short distance away, were not involved. It would appear from these results that the eradication of Solanaceous weeds from the vicinity of tobacco plantations is superfluous, though it is advisable to remove them, especially if infected, from the fields themselves.

JOHNSON (J.) & OGDEN (W. B.). **Tobacco mosaic and its control.**—*Bull. Wis. agric. Exp. Sta.* 445, 22 pp., 8 figs., 1939. [Received April, 1940.]

An account is given in semi-popular terms of the symptoms, cause, losses due to, manner of spread, and control of tobacco mosaic. In Wisconsin the most usual and the most important source of infection is the planting of tobacco on land on which an infected crop was grown the previous year. If the percentage of mosaic in any field is high, and other suitable land is available, a change should be made. Tobacco refuse should not be used as seed-bed fertilizer or for insecticidal purposes. All seed should be free from chaff. The ploughing-under of refuse is useless, and tobacco trash should not be used as a field fertilizer unless allowed to decay on the land for five to six months before the crop is planted. With regard to the use of tobacco by workers in the crop, it is pointed out that the use of unmanufactured leaf is most likely to set up infection, since it may contain more virus than the manufactured product, and is often handled more carelessly. The percentage of mosaic resulting from the use of manufactured tobacco by workers is very low in comparison with that due to infested soil, but such use may cause a limited amount of infection, which can, however, be obviated by avoiding all use of tobacco when handling the plants, or by resorting to tobacco that has been sterilized for 15 minutes at least in 'dry' steam or hot air. Seed-beds should be not situated near the tobacco sheds, and frames, covers, and tools should not be stored in the sheds. The roguing of small percentages of diseased plants from the field early in the season is advisable, if tobacco has not been grown on the land for two years or more, but roguing is not practicable on old infected land. Spread in the field can be much reduced by handling diseased and healthy plants separately during field operations, especially topping. In conclusion, it is pointed out that control measures must be adapted to suit the requirements of each particular farm: there are no hard-and-fast rules equally applicable to all conditions.

BONNEMAISON (L.). **La maladie bronzée de la Tomate.** [Spotted wilt of Tomato.]—*Ann. Épiphyt.*, N.S., v, 3, pp. 268–308, 21 figs., 1 graph, 1939.

In this paper the author reviews and discusses the information at present available on the 'maladie bronzée' or spotted wilt of tomato

and its insect vector *Thrips tabaci*. [The bibliography comprises over 90 items.] Investigations (mainly entomological) carried out on the subject near Bordeaux in 1936–7 and in the vicinity of Lyons in 1938 are also described [cf. *R.A.M.*, xviii, p. 65].

The disease was observed in the departments of Gironde, Dordogne, Rhône, Isère, and Nord, and is therefore probably present in most parts of France. The symptoms [which are described] observed on naturally infected tomato, tobacco, *Dahlia*, *Zinnia*, and China aster [*Callistephus chinensis*] in the south-west differed somewhat from those noted in the south-east, presumably owing to climatic and environmental differences in the two localities. It was concluded that the rapidity with which the symptoms appear on tomato plants depends on the growth rate of the plant, young plants being much more susceptible than older ones to the effects of the virus.

CHAMBERLAIN (E. E.). **A streak disease of Tomatoes in New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxi, 5, pp. 266–271, 3 figs., 1940.

Tomato streak, first recorded in New Zealand in 1922, has been observed during the past seven years in the Auckland, Poverty Bay, Wellington, Nelson, and other districts, causing losses of 15 to 20 and up to over 50 per cent. in the field and under glass, respectively. All attempts to transmit the disease from infected to healthy tomatoes have resulted in the exclusive development of tobacco mosaic symptoms, suggesting that the agent of streak in the Dominion is either tobacco mosaic or a mixed virus, one component of which is tobacco mosaic and the other a virus not transmissible by artificial inoculation [cf. *R.A.M.*, xvi, p. 348; xvii, p. 77].

MARCHIONATTO (J. B.). **Argentine Republic: the 'mancha bacteriana' of the Tomato.**—*Int. Bull. Pl. Prot.*, xiv, 2, p. 25, 1940.

Investigations by Lydia S. Spaini are stated to have shown that bacterial spot of tomato in the Argentine is due to *Bacterium vesicatorium*, inoculations with which on the leaves, stems, and fruits of the host resulted in the typical symptoms of the disease, namely small, dark green, water-soaked, circular, yellow-bordered spots on the foliage, and green or brown, dark-edged blotches on the fruits.

YOUNG (P. A.), HARRISON (A. L.), & ALTSTATT (G. E.). **Common diseases of Tomatoes.**—*Circ. Tex. agric. Exp. Sta.* 86, 32 pp., 16 figs., 1940.

Popular notes are given on the symptoms and control of the most prevalent and injurious diseases of tomatoes in Texas, with sections on control measures against tomato diseases in general, the preparation of Bordeaux mixture, and rules to be observed when spraying.

HEMMI (T.) & AKAI (S.). **Pathological studies on Polyporus rhodophaeus Lév.**—*Ann. phytopath. Soc. Japan*, ix, 4, pp. 199–210, 1 pl., 3 figs., 1939. [Japanese, with English summary.]

A list is given of broad-leaved species of trees which in Japan act as the hosts of *Polyporus rhodophaeus*, stated to have been referred to by some workers as *P. semilaccatus* [*R.A.M.*, viii, p. 267]. The fungus

has been reported to occur most commonly on various species of cherry in Japan, where, from the authors' observations, *Robinia pseud-acacia* would appear to be one of the most susceptible hosts. In this host, decay due to the fungus begins in the sapwood and spreads inwards causing peripheral rot, but sometimes in a very irregular way, the central portion of the heartwood being attacked, while sound tissues remain in the outer portion. The fungus is classified in the 'corrosion' group [ibid., vii, p. 68]; in culture it grows at (approximately) 11° to 40° C., the optimum temperature for mycelial growth being about 31° to 32°.

ANKOUDINOFF (A. M.). Сердцевинная гниль Осины. [Heart rot of Aspen.]—*Лесное Хозяйство* [*Forest Husbandry*], *1939*, 8, pp. 43–49, 4 figs., 1939.

In a study on the heart rot of aspen caused by *Fomes igniarius* [*R.A.M.*, x, p. 416; xvii, p. 214], conducted during 1937–8 in the U.S.S.R., special attention was given to the red (pink to purple-brown) discoloration of the heart which usually occurs to a small extent during the first year of growth, but within five years is encountered in every tree of the stand, affecting over 70 per cent. of the stem length. True heart rot, on the other hand, is not observed at all in trees under five years old, and only in individual trees from 5 to 23. Isolations from 234 samples of discoloured aspen wood of all ages in no case yielded *F. igniarius*; 129 samples yielded sterile cultures, and 91 several saprophytic fungi, including *Verticillium* spp., particularly one resembling *V. robustum*, *Sclerotium* spp., *Torulaspora*, *Macrosporium* sp., and *Tremella* sp. Following artificial infection with *F. igniarius* wood of felled aspen developed heart rot rapidly (after six months) and that of growing aspen slowly (after three years), but in neither case did the red discoloration develop. It is concluded that this condition is not due to parasitic fungal attack and does not, as previously suggested, represent the first stage of heart rot. The main factor causing red discoloration in aspens up to three years old appeared to be mechanical injury to the stems, caused either by men, saprophytic fungi, or insects, and in older ones the unhealed dead twigs. Essential for the control of both this disorder and heart rot proper is the choice of a suitable, preferably low-lying site with a rich, not sandy soil with a plentiful supply of ground water, good care of the stands, avoiding mechanical injury to the stems, removal of injured trees and sources of infection in young stands, thinning in older ones, and pruning of dead twigs.

MILLER (P. W.). **Further studies on the comparative efficacy of Bordeaux mixture, copper oxalate, and some other 'insoluble' copper sprays for the control of Walnut blight.**—*Rep. Ore. St. hort. Soc., 1939*, pp. 127–134, 1940.

In further efforts to find a copper spray as effective as Bordeaux mixture in controlling walnut blight (*Phytomonas* [*Bacterium*] *juglandis*) [*R.A.M.*, xviii, p. 423] and yet not injurious to foliage, tests were conducted in Oregon in 1939 with various water-insoluble copper materials. Copper oxalate was highly effective provided it was used at a sufficiently strong concentration and the spray applications were

properly timed and thoroughly applied (the few notably unsatisfactory results were found to be due to one or all of these conditions being disregarded). Three applications of pure copper oxalate (40 per cent. copper) used at the rate of 3 lb. to 100 gals. of water reduced the amount of infected nuts from 44·9 to 1·4 per cent., while an impure sample (19 per cent. copper) used at the same rate reduced it to 4 per cent. Under conditions of moderately severe to severe infection the more economical impure oxalate was less effective at 3 lb. than at 4 lb. to 100 gals., the former reducing the incidence of infected nuts from 36·2 to 11·9 per cent. and the latter to 0·9 per cent. Three applications of a dust composed of 20 parts of copper oxalate, 67 of talc, 10 of diatomaceous earth, and 3 of 'vatsol' wetter, gave the best control of any dust used up to the present time (reducing the amount of infected nuts from 47·8 to 7·5 per cent.), but were not as effective as 6–2–100 Bordeaux mixture (which reduced it to 1·4 per cent.). Good control and no foliar injury resulted from the use of yellow cuprous oxide, 45 per cent. copper oxychloride, and copper acetonate, all at the rate of 3 lb. to 100 gals. Poor to fair control was obtained with zinc ammoniacal copper silicate at 3 lb. to 100 gals., and brown cupric oxide and a proprietary copper fungicide (35 per cent. copper) both at 4 lb. to 100 gals., although all three materials were non-injurious to the foliage.

GENEAUX (C. M.) & KUENZEL (J. G.). **Defects which reduce quality and yield of Oak-Hickory stands in southeastern Iowa.**—*Res. Bull. Ia agric. Exp. Sta.* 269, pp. 408–444, 12 figs., 1 map, 1939.

Most of the basal decay in oaks (chiefly white) in the forests of southeastern Iowa was found to be due to *Stereum gausapatum* [*R.A.M.*, xix, p. 245]. Sapwood rot of the same host was caused by *Strumella corynoidea* [ibid., xiii, p. 605], apparently a new record for the State. The principal agent of oak branch stub decay was *Poria andersonii* [ibid., xvi, p. 505]. *Auricularia auricula-judae* was isolated from the rotted heartwood of three living black walnut [*Juglans nigra*] trees, but its etiological implication has not yet been established. *Nummularia* sp. was obtained only once from decayed red oak sapwood, but its characteristic encrusted lesions were observed on dead red, black, and shingle [*Quercus imbricaria*] oaks, and hickory, as well as on some moribund trees, indicating its possible involvement as a contributory cause of death.

CROWELL (I. H.). **New species of Gymnosporangium.**—*Canad. J. Res.*, Sect. C, xviii, 1, pp. 10–12, 1 fig., 1940.

Descriptions [with Latin diagnoses] are given of three new species of *Gymnosporangium*. *G. minus*, described from the teleuto stage only, was collected on *Cupressus sempervirens* near Athens, Greece, and is stated to be the only species of *G.* recorded from Europe as forming its teleuto stage on a host other than *Juniperus*. The teleutosori are caulicolous, pulvinate, yellowish-brown or chestnut, and the teleutospores are ellipsoidal, usually uni-, rarely non-septate, 45·5 to 59·5 by 17·5 to 24·5 μ, with two germination pores near the septum, and with a short hyaline pedicel; the teleutospores are narrower and considerably longer and more rotund terminally than those of *G. sabinae*. *G. guate-*

malianum was found forming spermogonia and aecidia on leaves of *Amelanchier nervosa* in Parramos, Guatemala, and *G. meridissimum* forming teleutospores on twigs of *C. benthami* in two localities in Guatemala. The teleutosori of *G. meridissimum* are caulicolous, pulvinate, yellowish-brown or chestnut, and the teleutospores are ellipsoidal with a median septum, 48 to 60 by 24 to 28 μ, with two germination pores near the septum or one near the septum and one near the apex, and with a long, hyaline pedicel. This is the only species of *Gymnosporangium* on a non-*Juniperus* teleuto host known to form rotund galls. *G. guatemalianum* and *G. meridissimum* are possibly different stages of the same species. The Guatemalan stations for these species are the most southerly records of *Gymnosporangium* and all the hosts are new for the genus.

LIEBSTER (G.). **Baumschulverluste durch den Kiefernnadelblasenrost.** [Tree nursery losses from Pine needle blister rust.]—*Blumen- u. PflBau ver. Gartenwelt*, xliii, 52, pp. 556–557, 3 figs., 1939.

The recrudescence in a severe form of pine needle blister rust (*Coleosporium* [spp.]) in a north-west German nursery [*R.A.M.*, viii, p. 344] in 1939 after a long period of quiescence (since 1923 in the Chorin forest range, the previous record dating back to 1879 in Moravia) indicates that the disease may assume practical importance from time to time. Three- to ten-year-old trees of *Pinus sylvestris*, *P. montana*, and *P.* [*nigra* var.] *austriaca* are the preferred hosts, though infection may occur on those of all ages up to about 30 years. The life-history of the rust is briefly outlined in semi-popular terms. Its alternate hosts include a number of weeds commonly found in meadows or gardens adjoining the nurseries, e.g., species of *Senecio*, *Sonchus*, *Inula*, *Tussilago*, *Petasites*, *Adenostyles*, *Campanula*, *Melampyrum*, *Euphrasia*, and *Alectorolophus*, the eradication of which therefore constitutes the first line of attack against the parasite.

BUCHANAN (T. S.). **Needle-bearing internodes on Western White Pine reproduction in relation to blister rust infection.**—*J. For.*, xxxviii, 1, pp. 52–54, 1 graph, 1940.

It has been definitely ascertained that the current season's shoots of western white pine (*Pinus monticola*) are relatively resistant to blister rust (*Cronartium ribicola*) [*R.A.M.*, xviii, p. 216]. In order to obtain information as to the proportion of the target of infection presented by this material, 24 trees, 4 to 19 years old, were selected for study in the St. Joe National Forest, Idaho. Assuming characteristic needle retention, it was found that the current season's growth presented a blister rust target which rarely exceeded that of one-year-old needles by 2½ times, and that only on two- to four-year-old trees. The usual ratio of current season's to one-year-old growth for 5- to 19-year-old-trees was somewhat less than 1·5 : 1.

GAVRIS (V. P.). Селекционный отбор иммунных форм Сосны обыкновенной. [Selection of immune forms of common Pine.]—*Лесное Хозяйство* [*Forest Husbandry*], *1939*, 8, pp. 5–8, 1939.

Following the droughts of recent years, 2- to 12-year-old planted and

self-sown pines in the Nicolo-Polomsk forest station [U.S.S.R.] suffered during 1937–8 from severe attacks of *Melampsora pinitorqua* [*R.A.M.*, xix, p. 54]. Most of the two- to three-year-old seedlings perished and 90 to 95 per cent. of the young self-sown pines were infected. Investigations showed that the weight of 1,000 seeds varied in different strains of pine from 3·5 to 8 gm. and was a constant character for each strain over a period of years. A survey of seedlings grown from seeds from eight different trees showed a rough correlation between heavy seeds and resistance, the maximum number of diseased seedlings, 44 per cent., corresponding to a weight of 4·1 gm. per 1,000 seeds, and the minimum, 9 per cent., to that of 5·7 gm. It is concluded that strains of pine with a seed-weight of about 6 gm. per 1,000 seeds or above are the most resistant, and the existence of resistant strains being thus indicated it is suggested that further work should lead to the selection of strains immune from the disease.

García (L. A. A.). **A Cedar seedling blight in Puerto Rico.**—*Caribb. Forester*, i, 2, p. 26, 1940. [Spanish summary. Mimeographed.]

In February, 1937, *Cedrela mexicana* seedlings near Luquillo, Puerto Rico, were severely attacked by *Phyllachora balansae*, the conidial stage of which is a species of *Linochora*. The yellowish-brown, mostly ill-defined spots on the leaves, up to 25 mm. in diameter, give rise on both sides, especially the upper, to between 50 and 100 minute, erumpent, black, gregarious fruit bodies. In severe cases the foliage turns yellow and is shed, the plants eventually dying. Petioles and young twigs are also liable to infection.

Findlay (W. P. K.), Birkinshaw (J. H.), & Webb (R. A.). **Food group-microbiological panel. Investigations of the wood-rotting fungi. Biological methods. Chemical methods.**—*Chemistry & Industry* (formerly *J. Soc. Chem. Ind., Lond.*), lix, 6, pp. 95–96, 1940.

W. P. K. Findlay, discussing biological methods of investigating wood-destroying fungi, states that two types of metabolic products synthesized by these organisms have been studied, namely, aromatic substances and organic acids. Many pathogens of wood produce highly characteristic aromatic odours enabling them to be recognized in culture [*R.A.M.*, xix, p. 213]. Particularly interesting in this respect is *Lentinus lepideus*, the acicular crystals on the mycelium of which appear to be associated with the smell of balsam of Peru. It is thought that the exceptionally high resistance of this fungus to creosote [ibid., xviii, p. 829] may be due to its production of methoxy derivatives of phenolic acids.

Fungi causing brown rots, with their mainly hydrolytic reactions, form larger amounts of acid than the agents of white rots, in which hydrolysis is accompanied by oxidation [ibid., xviii, p. 360], resulting in a depletion both of the lignin and cellulose contents of the wood.

The researches to date have been conducted on sterilized blocks of Scots pine [*Pinus sylvestris*] sapwood on malt agar in specially constructed Kolle flasks with a moisture reservoir in the neck, from which

samples are removed for chemical analysis after two to six months' incubation at 22° C.

J. H. Birkinshaw and R. A. Webb separated the volatile products formed by *L. lepideus* on Scots pine sapwood by steam distillation, thereby obtaining a mixture of esters, including methyl-para-methoxycinnamate, methyl cinnamate, and an unidentified ester of anisic acid. These products were absent from uninfected wood, whereas methyl-para-methoxycinnamate was formed by the growth of the fungus on malt agar.

The distillate from Scots pine sapwood rotted by *Coniophora cerebella* [*C. puteana*], extracted with cold water and evaporated *in vacuo*, contained, in addition to formic and acetic acids (also derived from sound wood), polysaccharides precipitable by alcohol, ether-soluble acids, including citric acid, and ether-insoluble acids. Citric acid, which could not be isolated from healthy material, is regarded as a metabolic product of the fungus.

The papers were followed by a discussion.

Butovitsch (V.) & Spaak (H.). **Studier och försök att skydda i skogen kvarliggande timmer mot insekter och svampar jämte beräkninga av konserveringsmetodernas ekonomiska förutsättningar.** [Studies and experiments on the protection against insects and fungi of logs left in the forest, with calculations of the profitability of the methods of preservation employed.]—*Norrlands SkogsvFörb. Tidskr.*, *1939*, 3, 120 pp., 1939. [German summary. Abs. in *For. Abstr.*, i, 4, pp. 278–280, 1940.]

Much of the 400,000 cu. m. of Scots pine [*Pinus sylvestris*] and Norway spruce [*Picea excelsa*] timber thrown in the forests of southern Hälsingland, central Sweden, by two storms, one in September, 1937, and the other in March, 1938, had to be left lying over the following summer, and efforts were made to protect it by (*a*) spraying the barked and unbarked logs before stacking with 15 or 20 per cent. carbokrimp carbolineum, a fungicide known as rustikol (undiluted), and several solutions of various arsenical salts, the stacked logs being covered on all sides with a layer of spruce slash or moss, and (*b*) storing the unbarked material in a trench in wet peat soil and covering with a sphagnum layer to a depth of 20 to 30 cm. Examination in October, 1938, revealed a fairly close correlation between insect depredations and [unspecified] fungal sap stain, *Hylastes cunicularius* in particular being associated with extensive discoloration of spruce. The extent of sap stain was much reduced by shading but if the slash covering afforded efficient protection against drying out, shading had no effect. Of the chemical preservatives tested, only rustikol was of any fungicidal value; the arsenical preparations not only failed to control, but even appeared to stimulate, the development of sap stain. On the other hand, storage in wet peat was effective, due to a heavy increase in the moisture content of the logs. In the case of unbarked sawn timber, top logs were more severely damaged than unbarked butt ones by rot fungi [unidentified]; in barked logs there was no significant difference. In contrast to the sap-staining fungi the rot fungi were less injurious to well than to poorly illuminated stacks. Spruce was more susceptible

to decay than pine, which suffered chiefly from sap stain. On the basis of the results given by the sawn boards, it is estimated that pine of the fourth quality and under will not pay for treatment, the economic limit for spruce lying somewhat higher.

GÄUMANN (E.). **Über die Temperaturansprüche des Hausschwammes.** [On the temperature requirements of the dry rot fungus.]—*Zbl. Bakt.*, Abt. 2, ci, 21–22, pp. 409–410, 1940.

The recent occurrence within the city of Zürich of intensive outbreaks of dry rot (*Merulius lacrymans*) in cellars with a maximum temperature of 10° C. suggested the possible existence of a physiologic race of the fungus capable of thriving in a colder atmosphere than that usually regarded as the optimum (18° to 22°). The optimum temperature for growth of the fungus, estimated by the diameter of 15-day-old cultures on malt agar and by the degree of destruction of spruce sapwood in eight months, was found to be 15° to 18°, while fair growth, resulting in the destruction of about 7 per cent. of the wood, was made at 0°, the minimum apparently lying at −2° instead of 3°, whereas the maximum of 24° to 27° is the same as for ordinary strains of *M. lacrymans*.

HENDERSON (F. Y.). **Timber: its properties, pests, and preservation.**—185 pp., 45 figs., 12 diags., 2 graphs, London, Crosby Lockwood & Son, 1939. 9*s*. 6*d*.

This elementary manual on timber technology contains sections on natural defects, durability, and decay, with special reference to dry rot (*Merulius lacrymans*), the cellar fungus (*Coniophora cerebella*) [*C. puteana*], staining fungi (*Ceratostomella* spp.), and on modern methods of preservation.

HUBERT (E. E.). **Toximetric method for oil-soluble wood preservatives.**—*Industr. Engng Chem.*, Analyt. Ed., xii, 3, pp. 139–141, 1940.

Detailed directions are given for the evaluation of oil-soluble wood preservatives by a method developed by members of the Preservative Standards Advisory Committee of the [United States] National Door Manufacturers' Association. The technique provides for the establishment of minimum requirements for various properties of the toxic chemical, e.g., toxicity and permanence in wood, and of the treating solution, such as concentration of toxicant, flash point, volatility, and leachability. The wood prescribed for use in the tests is kiln-dried *Pinus ponderosa* sapwood and the fungi to be used are approved strains from the Forest Products Laboratory of *Lenzites trabea* (for decay) and *Hormiscium gelatinosum* (for staining) [*R.A.M.*, xviii, p. 285].

'Ascu' wood preservative.—*Curr. Sci.*, ix, 1, p. 3, 1940.

It is announced that the Forest Research Institute [Dehra Dun] withdraws the publication entitled '"Ascu"—a wood preservative' (*Indian For. Rec.*, N.S., *Utilisation*, i, 6) [*R.A.M.*, xvii, p. 716], and will postpone its reissue in a revised form until further investigations have been completed.

Steinherz (D.). **Fluorine compounds as wood preservatives. A review of methods of application.**—*Canad. Chem. Process Industr.*, xxiii, 12, p. 601, 1939.

The author gives a valuable review of the progress made in the use of fluorine compounds in the preservation of wood from their introduction in 1861 to the present day.

Hattori (T.) & Tamura (T.). **On the effect of electricity upon the growth of wood-destroying fungi.**—*Ann. phytopath. Soc. Japan*, ix, 4, pp. 211–222, 7 figs., 1939. [Japanese, with English summary.]

When *Poria vaporaria*, *Polystictus sanguineus*, and *Schizophyllum commune* were exposed to the effects of direct, alternating, and high-frequency electric currents run through (1) a piece of wood placed on a fungal mat growing on culture medium, (2) the fungi on a culture medium, and (3) the fungi grown on a piece of wood, it was found that the current checked fungal growth and destroyed the fungi at a point where density of current was great. Direct current was more effective than alternating current, and high-frequency current had little effect. The checking effect observed is attributed to heat, the production of toxins through electrolysis, the movement of charged substances and the migration of nutritive elements, due to electro-endosmosis, and, also, destructive action. Experiments showed, however, that the first two effects were insufficient in themselves to check fungal growth. As colouring matter diffused out of the cells of *P. sanguineus*, electro-endosmosis would appear to exercise a marked effect on the growth of these fungi.

Findlay (W. K. P.) & Pettifor (C. B.). **Effect of blue stain on the strength of Obeche (Triplochiton scleroxylon).**—*Emp. For. J.*, xviii, 2, pp. 259–267, 1 pl., 1939.

A tabulated account is given of the writers' mechanical tests and chemical analyses at the Forest Products Research Laboratory, Princes Risborough, of selected samples of blue-stained obeche (*Triplochiton scleroxylon*) cut from a log freshly imported by the United Africa Company which was badly affected by blue stain (*Botryodiplodia theobromae*). This fungus has been isolated frequently from stained logs left lying about in the forest or in storage before shipment from Nigeria or the Gold Coast. One series of experiments was carried out on samples exposed under regulated conditions to infection by the fungus, and another on matched controls, half the material in each case being sterilized by intermittent steaming (45 minutes on three successive days at atmospheric pressure). Infection was found to result in a substantial reduction in toughness (amounting in one group of heavily stained specimens to 43 per cent.), a diminution of bending strength (up to 19·7 per cent.), a decline of roughly 7 per cent. in stiffness (the sterilized timber showing a negligible change), and a decrease in specific gravity (maximum 12·5 per cent.). The fungus further caused a serious depletion in the content of the wood in water-soluble substances (from 7·09 to 2·70 per cent.) and also attacked the cellulose, pentosans, and lignin in a manner typical of the 'white' group of wood-destroying fungi.

Moore (G. E.). **Concentrations of water-soluble preservatives in treated timber.**—8 pp., 3 figs., 1 graph, Ottawa, Forest Products Laboratories, 1939. [Mimeographed.]

Analysis of sample pieces from two jack pine [*Pinus banksiana*] railway sleepers, pressure-treated in 1924 with zinc chloride at the rate of ½ lb. per cu. ft., placed on the track in 1925 and removed in 1929, showed that the average weight of zinc chloride (estimated from zinc determinations) per cu. ft. for the whole sleeper was 0·108 and 0·096 lb., respectively. Similar but more detailed analyses of eastern hemlock [*Tsuga canadensis*] sleepers receiving the same pressure treatment, placed in position in 1929 and removed in 1938, are tabulated. In one typical instance, the zinc chloride concentration, averaged over the whole sleeper, amounted to 0·089 lb. per cu. ft., as calculated from zinc determinations, and 0·021 lb. per cu. ft. as calculated from chlorine determinations. These differences are attributed to the well-known property of zinc chloride of forming basic chlorides and hydrochloric acid, of which the latter is readily leached from the wood. The data show that in four years the concentration of zinc chloride, as calculated from zinc determinations, was reduced to about 20 per cent. of its initial concentration in the jack pine and in nine years to rather less than 20 per cent. in the eastern hemlock. Variations in zinc chloride concentration in different parts of any one sleeper appeared to have little significance. In general, decay [unspecified] was confined to the spike holes and ends, little or none being found in the centre portion. No definite conclusion was reached as to the amount of zinc chloride required to inhibit decay but there were indications that a considerable proportion of this substance is lost within a few years of installation.

Aspen posts were butt-treated (after seasoning) by being placed to a depth of 2 ft. 6 in. in a 5 per cent. zinc chloride solution kept at 190° to 200° F. for one half to one hour, and left standing for 36 hours in the solution (which was allowed to cool); in the course of the treatment the posts absorbed 2 to 3¾ lb. of solution, or 0·10 to 0·18 lb. of zinc chloride. Detailed examination of one post after four years' service showed that the amount of zinc chloride present per cu. ft. (calculated from zinc determinations) at 24, 15, and 5 in. below the ground-level was 0·113, 0·143, and 0·110 lb., while at 5, 25, and 55 in. above the ground-line it was 0·305, 0·264, and 0·155 lb., the corresponding figures, based on chlorine determinations, being 0·013, 0·024, 0·021, 0·249, 0·266, and 0·170 lb. The total amount of zinc chloride in the post, based on zinc and chlorine determinations, was 0·110 and 0·090 lb., respectively. These figures indicate that service conditions not only remove water-soluble preservative from a standing post, but cause the preservative to move to parts, such as the centre above the ground, where protection is scarcely necessary. The zinc ion appears to be more stable than the chlorine ion, and while the zinc moved upwards in appreciable quantities, chloride in more than equivalent amounts was lost from below ground-level, or moved upwards. In 64 posts treated with zinc chloride and kept in service for 12 years only slight decay was found below ground-level, and only one replacement had been necessary, the small amount of zinc chloride remaining in the butts having increased their service life.

Examination of two aspen posts, the butts of which had been steeped in copper sulphate solution for 6 to 8 hours, showed that most of the salt was concentrated in a quarter-inch outside shell extending almost the whole length of one pole and less than half the length in the other, a phenomenon which cannot be readily explained.

SEMPIO (C.). **Secondo contributo alla conoscenza dell' azione esercitata da vari fattori ambientali su alcune malattie parasitarie di piante coltivate ('ruggine bianca del Ravanello').** [A second contribution to the knowledge of the action exercised by various environmental factors on some parasitic diseases of cultivated plants ('white rust of Radish').]—*Riv. Pat. veg.*, xxx, 1–2, pp. 29–64, 2 pl., 13 graphs, 1940.

Further experiments, on the same lines as those previously described [*R.A.M.*, xviii, p. 471], carried out to ascertain the effects of various environmental conditions on infection of red radish by *Cystopus candidus* during the three main phases of infection [one to three, four to seven, and seven to ten days after inoculation: loc. cit.] showed that the temperature most favourable to infection was approximately 16° to 18° C., though the disease developed readily at 12° to 21°. The lowest and highest temperatures at which infection occurred were, respectively, 6° to 7° and 28° to 29°. Above 24° the effects of temperature were most marked in the third phase (which is considered to be a critical one for the host-parasite complex), there being a reduction in the intensity of attack and delay in the appearance of the symptoms. The second phase was the least affected by high temperatures, while the first was intermediate and less constant in this respect.

When inoculated plants were subjected to relative humidities of 98 to 100 per cent., final infection was generally less severe than in plants kept in relative humidities of 60 to 80 per cent.; evidence was obtained that high humidity was most unfavourable to the second and third phases.

When infected plants were kept in darkness during the first period the disease was usually stimulated as compared with the controls, but during the third period exposure to darkness constantly reduced infection. The second period was intermediate in this respect.

The second phase was the least affected by exposure to carbon dioxide but the most sensitive to ultra-violet rays while the third phase exhibited the opposite reactions to these two agents.

KANIVETZ (I. I.). Роль гриба **Trichoderma lignorum** и корневых систем Сахарной Свеклы, озимой Пшеницы, Овса, Люпина и Клевера в создании почв с прочной структурой. [Role of the fungus *Trichoderma lignorum* and the root systems of Sugar Beet, winter Wheat, Oats, Lupin, and Clover in the consolidation of soils.]—*ex* Сборник научно-исследовательских работ ВНИС, Госуд. Издат. колх.-совх. Литер. УССР [Collection of scientific research papers of the Pan-Soviet Scientific Research Institute for the Sugar Beet Industry, State Publ. Off. Lit. coll. co-op. Fmg Ukraine], pp. 136–172, 8 figs., 1939.

BEREGOVAYA (Mme M. M.). О методике искусственного заражения высадков Сахарной Свеклы в связи с селекцией на устойчивость

к церкоспоре. [On methods of artificial infection of Sugar Beet seedlings in selection tests for resistance to *Cercospora*]—ibid., pp. 302–308, 4 figs., 1939.

In the first paper the author states that the aggregation of soil particles was found to be greater in rhizospheres of winter wheat, oats, sugar beet, lupin, and clover than in the surrounding soil. In fields of winter wheat, oats, and sugar beet, foci were observed in which such aggregation was three or four times greater than in the surrounding soil, the phenomenon being attributed to the presence of manure or compost, or the activity of earthworms or micro-organisms [*R.A.M.*, xviii, p. 817; xix, p. 115], particularly *Trichoderma lignorum* [*T. viride*: ibid., xviii, p. 761]. Artificial infection of soil with *T. viride* (in the case of sugar beet also with *Aspergillus niger* and *Azotobacter*) resulted in an increase in soil aggregation in the rhizospheres of winter wheat, oats, lupin, and sugar beet of 126·2, 161·8, 39·9, and 12·5 per cent., respectively. Chemical analysis showed that soil taken at harvest time from rhizospheres of winter wheat or oats or the foci of aggregation contained more free nitrogen, phosphorus, and potassium than the surrounding soil.

In the second paper the author recommends that tests of the resistance of sugar-beet varieties to *Cercospora beticola* be carried out on two-year-old transplants. The best results were obtained by spraying the leaves of the test plants with a conidial suspension at the rosette stage before flowering, at a minimum temperature of 17° to 18° [C.] and a humidity not less than 94 to 100 per cent.

WEIMER (J. L.). **Methods of value in breeding Austrian Winter field Peas for disease resistance in the south.**—*Phytopathology*, xxx, 2, pp. 155–160, 2 figs., 1 graph, 1940.

The failure of most pea varieties to survive winter conditions in Georgia led to the construction of an electrically heated and controlled hot-bed, regulated by thermostats to a temperature of 35° F. A considerable number of plants can be tested by this method for resistance to *Ascochyta pinodella* and *Mycosphaerella pinodes* [*R.A.M.*, xviii, p. 237], severe epidemics of which were produced on four- to five-week-old Austrian Winter seedlings with pure cultures.

WADE (B. L.) & ZAUMEYER (W. J.). **Genetic studies of resistance to Alfalfa mosaic virus and of stringiness in Phaseolus vulgaris.**—*J. Amer. Soc. Agron.*, xxxii, 2, pp. 127–134, 1940.

A tabulated account is given of the writer's studies at Charleston, South Carolina, on the inheritance of resistance to lucerne mosaic virus 1 [*R.A.M.*, xvii, p. 721] and stringiness of pods in the F_2 and F_3 of a cross between strains of Corbett Refugee and Great Northern beans (*Phaseolus vulgaris*) and reciprocals. From observations on over 400 F_2 plants and more than 300 F_3 families, resistance to mosaic was concluded to be due to duplicate dominant genes giving a ratio of 15 resistant to 1 susceptible in F_2 and a ratio of 7 resistant to 4 segregating 3 : 1, to 4 segregating 15 : 1, to 1 susceptible in F_3. No correlation was detected between stringiness and mosaic resistance, the former character being due to duplicate recessive genes in which the dominant allelomorphs are complementary.

Fedotova (Mme T. I.). Применение упрощенных серологических реакций в определении устойчивости сортов к заболеваниям. [Application of simplified serological reactions for the determination of varietal resistance to disease.]—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 85–91, 1 fig., 1939.

In further investigations on the determination of varietal resistance of plants to disease by serological methods [*R.A.M.*, xviii, p. 127], the 'ring' reaction was studied in 14 varieties of beans in relation to their resistance to *Bacterium medicaginis*. The technique consists in pouring a thin layer of immunized serum (at a dilution of 1 in 20 or 1 in 40) with the help of a pipette over a layer (2 to 3 drops) of the antigen at the bottom of the test-tube, the most precise results being obtained with antigens stored for 24 hours at 5° to 8° C. after preparation and sera of high titre. The precipitin ring formed where the two liquids touch is either prominent and persistent (type $+_2$), or at first rather ill-defined and later on assuming either more marked outlines or disappearing altogether (type $+_1$); sooner or later both types diffuse and are then designated type $+_3$. Very susceptible varieties gave the type $+_2$ reaction after 10 to 30 minutes, turning into type $+_3$ only after 24 hours or later; slightly susceptible varieties gave the type $+_1$ reaction after 40 minutes to 5 hours, turning into type $+_3$ after 3 to 24 hours; the medium susceptible varieties first formed type $+_1$ rings, which soon turned into $+_2$ and then gradually diffused; while resistant varieties gave no precipitin at all. The ring reaction was strictly specific and gave no precipitate with normal sera. The results obtained by this method agreed entirely with those obtained in agglutination tests, and it is recommended for large-scale practical work. Several experiments with the drop method, which consists in mixing one drop of serum with one drop of antigen on a glass slide, gave unreliable results.

Enken (V. B.). Поражаемость Фасоли бактериозами. [The susceptibility of Beans to bacterial diseases.]—*Селекция и семеноводство* [*Selection & Seed Growing*], *1939*, 9, pp. 17–20, 1939.

The following bacteria were isolated at Rostoff-on-Don from samples of diseased beans: *Bacterium phaseoli* (the most widespread species in the U.S.S.R.) [*R.A.M.*, xviii, p. 127], *Bact. phaseoli* var. *fuscans* [ibid., xviii, p. 495], *Bact. medicaginis* var. *phaseolicola* [loc. cit.], *Bact. heteroceum* [ibid., xvi, p. 85], *Bact. vignae* and its var. *leguminophilum* (the last two species having no practical importance); the symptoms caused by each organism are described. In breeding experiments conducted from 1933 to 1936 in the Kuban experiment station (Krasnodar district) it was found that differences in varietal resistance were most manifest at the stage of pod swelling. Of the varieties tested White Haricot Bean, Coco blanc, and Yellow Eye proved to be resistant, and Scotia and Striped Greaseback slightly susceptible.

Hemmi (T.) & Konishi (S.). **Studies on the Phytophthora rot of Eggplant on the market.**—*Ann. phytopath. Soc. Japan*, ix, 3, pp. 157–169, 1939. [Japanese, with English summary.]

Studies on a rotting of eggplant fruits on the market and in transit

in Japan showed the causal organism to be *Phytophthora melongenae*. Oospores were abundantly present in culture, and were also found in rotted host tissue. In culture, the fungus grew at temperatures ranging from (approximately) 16° to 36° C., the optimum temperature for fruit decay being approximately 28°. At 5° to 6° no infection of wounded fruit occurred. Vigorous growth of aerial mycelium on affected fruit took place in atmospheres of 95 per cent. or more relative humidity, though conidial formation was more abundant at 85 per cent. relative humidity or less than at higher humidities. The fungus was ascertained to be capable of infecting uninjured eggplant fruits and young eggplant seedlings, but it infected tomato and red pepper [*Capsicum annum*] fruits only when the inoculations were effected in needle wounds.

PARK (M.) & FERNANDO (M.). **A variety of Brinjal (Solanum melongena Linn.) resistant to bacterial wilt.**—*Trop. Agriculturist*, xciv, 1, pp. 19–21, 2 pl., 1940.

A description is given of a promising variety of eggplant highly resistant to bacterial wilt (*Bacillus* [*Bacterium*] *solanacearum*) in Ceylon. The seed was obtained from Raitalawela, in Matale South, where this variety (referred to as 'Matale') had been grown for some years. In 1937, when planted alongside an imported variety, Matale developed only 1 per cent. wilt in 1,450 plants, although the susceptible variety was most severely affected, and in another trial, the Matale variety developed only 0·9 per cent. infection, as against 69·1 per cent. infection in the Long Yellow variety, which was used as a control.

The Plant Protection Ordinance (Kenya), 1937. Government Notice No. 127 (1940).—1 p., 1940.

Government Notice No. 127 of 3rd February, 1940, amends Government Notice No. 687 of 2nd September, 1937 [*R.A.M.*, xvii, p. 640] by adding the following diseases [of tobacco], viz., *Bacterium tabacum*, *Bact. angulatum*, and *Cercospora nicotianae*, to those for the prevention or elimination of which in Kenya the Governor in Council is empowered to make regulations.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiv, 2, pp. 33–34, 36, 1940.

GERMANY (PROTECTORATE OF BOHEMIA AND MORAVIA). Decree No. 143 of 19th May, 1939, provides for the compulsory destruction, by proprietors or tenants of land or at their expense, of wild hop bines [against *Pseudoperonospora humuli*].

UNION OF SOUTH AFRICA. With a view to preventing the further extension of bacterial blight of vines (*Bacillus vitivorus*) in South Africa [*R.A.M.*, xviii, p. 768], Proclamation No. 50 of 14th March, 1939, withdraws the exemption of vines in the Cape Province from the restrictions on plant removal and prohibits the removal of vines or other plants or parts thereof of the family Vitaceae within or out of the districts of Somerset West, Stellenbosch, Worcester, and Wynberg, except under a written permit from the Department of Agriculture and Forestry.

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Roland (G.). **Bijdrage tot de kennis der virusziekten der Spinazie.** [Contributions to the knowledge of the virus diseases of Spinach.] —*Tijdschr. PlZiekt.*, xlv, 6, pp. 260–274, 2 pl., 1939. [French summary.]

A full account is given of the writer's studies at the Wageningen (Holland) Mycological Laboratory on spinach yellows and mosaic. The first disease is caused by the virus of beet yellows [*R.A.M.*, xix, p. 185] and the second by a virus of the cucumber 1 type [ibid., xviii, p. 647; xix, p. 186]. Both diseases are transmissible by *Myzus persicae* from infected to healthy spinach plants, yellows also being communicable from spinach to beet by this means; mosaic, but not yellows, can further be conveyed from plant to plant by grafting. The identity of mosaic with the American 'spinach blight', assumed by German workers [ibid., ix, p. 428], is not accepted on the grounds that the inoculation of tomato, *Datura stramonium*, and *Amaranthus retroflexus* gave positive results in the case of spinach blight and negative in that of mosaic.

Plants infected by either virus in the field are more or less chlorotic, the yellowing originating mainly between the veins of the outer leaves, the blades of which are curled, thickened, brittle, and turn blue on the application of Sachs's stain. The secondary phloem of the affected foliage shows gumming. In severe cases the heart leaves cease to grow and finally turn yellow, by which time the outer foliage has become so shrivelled that nothing remains but a rosette of small, yellowish, undeveloped leaves. Finally the whole plant dies.

In the greenhouse the symptoms of spinach mosaic on spinach, beet, cucumber, tobacco, and *Nicotiana glutinosa* are as follows. On spinach the parenchyma between the veins of the heart and middle leaves is discoloured. The network of the veins, even the very finest, stands out green in relief against the yellowish tissue of the lamina. The heart leaves are sometimes rolled. The chlorosis eventually reaches the outer leaves, which may sustain heavier damage than the younger ones. The blades of the young leaves may be distorted by a slight arching of the interveinal tissues.

On beet the young leaves show pale green, irregular spots, up to 0·5 cm. in diameter, becoming confluent and involving a more or less extensive area of the surface. Diseased plants are stunted, and the interveinal tissues of the young leaves sometimes arched.

The progress of the disease on cucumber is very swift and may be fatal. The young and middle leaves are soon quite yellow, and the growth of the plants is greatly retarded or entirely checked. The yellow lesions may assume the shape of rings.

On tobacco the symptoms are not always very conspicuous; they consist of a more or less acute chlorosis of the middle leaves, sometimes uniformly distributed over the surface and in other cases confined to the veins or the interveinal spaces. The leaf blades are often arched near the tip, at the site of the junction of the secondary veins.

On *N. glutinosa* the virus caused a pale spotting of the young foliage.

SOYER (Mme D.). **La 'rosette' de l'Arachide. Recherches sur les vecteurs possibles de la maladie.** [Groundnut rosette. Researches on the possible vectors of the disease.]—*Publ. Inst. nat. Étud. agron. Congo Belge,* Sér. sci., 21, 23 pp., 2 col. pl., 5 figs., 1939. 11 fr.

Both the ordinary chlorotic and the green type of groundnut rosette [*R.A.M.*, xii, p. 5; xvii, p. 582; xviii, pp. 434, 652] are found in the Belgian Congo. Attempts at transmission by sap inoculation, by growing the plants in supposedly infected soil, and by the use of seed from infected plants gave negative results; the disease was, however, successfully transmitted by grafting and by the insect *Aphis laburni.* Of a number of different plants growing in waste patches and harbouring *A. laburni* only *Centrosema plumieri* developed mosaic symptoms when infectious individuals of *A. laburni* were fed on it; it was not found possible to re-transmit the disease from *C. plumieri* to groundnut. At Gandajika losses from the disease may reach up to 90 per cent. of the crop. Creeping varieties are more susceptible than erect ones, and the second-season crops are more severely affected than the first. Thick sowing reduces the spread of the disease. Control methods consist in sowing the plants very thickly, the retardation of weeding, not growing two consecutive crops of groundnuts in the same plot, destroying the plants that arise from pods left in the ground, and the use of resistant varieties.

MONTEMARTINI (L.). **Un altro triennio (1937-39) di osservazioni sopra le malattie ed i parassiti delle piante coltivate nella Sicilia occidentale.** [A further three years (1937–39) of observations on diseases and parasites of plants grown in western Sicily.]—*Riv. Pat. veg.*, xxx, 1–2, pp. 1–28, 1940.

This report on plant diseases in western Sicily [cf. *R.A.M.*, xvi, p. 230] during 1937 to 1939, inclusive, contains, *inter alia*, the following items of interest. Plums were attacked by *Bacterium pruni* [cf. ibid., xiii, p. 562] and *Rhus coriaria* plants by *Exoascus* [*Taphrina*] *purpurascens.* The Perfection tomato variety showed symptoms of 'fernleaf', a condition which so far has not been common in Italy [ibid., xvi, p. 641]. *Quercus ilex* trees planted in the place of wilting *Ficus magnolioides* developed severe infection by *Phyllosticta quercus ilicis.* The aecidial stage of *Melampsora rostrupii* [ibid., xv, p. 618] was commonly present on *Mercurialis annua.*

SERVAZZI (O.). **Appunti di fitopatologia.** [Phytopathological notes.]—*Boll. Lab. sper. R. Oss. Fitopat. Torino*, xvi, 1–4, pp. 19–32, 1 pl., 1939 (issued 1940).

In 1938 the author observed *Pestalozzia guepini* [*R.A.M.*, x, p. 705; xi, p. 377] on the leaves of *Camellia japonica* at Turin. *Monochaetia compta* [of which a list of eight synonyms is given] was found on branches of cultivated roses in three localities. The author's observations show that the fungus grows as a saprophyte on sickly leaves and dried-up branches of roses, but is able to spread, on weakened hosts, to living leaves and branches. It was also found in association with *Coniothyrium wernsdorffiae* and *Hendersonia rosae*.

Cowpeas of American origin grown in Piedmont showed a condition apparently identical with that associated in Arizona with *Alternaria atrans* [ibid., ii, p. 250]. The 4- to 5-septate conidiophores, generally arranged in groups of 5 or 6 or more, measured 50 to 100 (occasionally up to 200) by 5 to 10 μ, and the [ob-]clavate, brown conidia with 5 to 10 transverse and 2 to 3 longitudinal septa measured 35 to 110 by 11 to 25 μ, and were frequently found in chains of 2 to 6. The disease appeared to follow aphid attack.

Owing to intensely cold weather spring defoliation of poplars due to *Pollaccia elegans* [ibid., xviii, p. 639] did not occur in any locality in 1939, though light leaf infections were found. The Sphaeropsid fungus (the correct name for which the author considers is *Phoma populina* (Vuill.) Sacc.) [ibid., xix, p. 51] was not observed. On withered shoots the author found the fungus he formerly identified as *Didymosphaeria populina*, but the correct name of which he considers is *Venturia populina* [loc. cit.]. This fungus was also obtained in culture from isolations of *Pollaccia elegans*. In the spring of 1939 it was found on trees observed to be infected the year before, the perithecia evidently having developed on shoots affected in 1938; other perithecia found in the summer of 1939 originated from infections occurring in the spring of the same year. *P. radiosa* (*V. tremulae*) [loc. cit.] was found on *Populus alba* and on a self-sown poplar, probably a hybrid of *P. alba* and *P. tremula*. On *P. alba* the fungus produced spots identical with those seen on *P. tremula* and *P. canescens* (a hybrid of *P. alba* and *P. tremula*). The uniseptate, almost piriform, light yellow-olivaceous conidia averaged 30 to 32 by 6 to 8 μ, and resembled those of the fungus described by Saccardo as *Clasterosporium asteroma* var. *macrosporum* on leaves of *P. alba*.

Chrysanthemums near Turin wilted and died as a result of attack by *Fusarium dianthi* [ibid., xii, p. 677]; there was evidence of marked varietal differences in susceptibility.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 1, pp. 15–19, 4 figs.; 3, pp. 155–159, 6 figs., 1940.

Heavy rains during November, 1939, in several wheat-growing areas in New South Wales stimulated extensive development of stem rust [*Puccinia graminis*] on crops already sappy and succulent from moist conditions prevalent earlier in the season, with resulting reductions in yield of 25 per cent. in some cases, as well as depreciated grain quality.

Many crops also showed extensive lodging, due, almost invariably, to frost damage in August and September. The Ford variety, in contrast to Dundee, was markedly resistant to rust [*R.A.M.*, xviii, p. 656]; Bencubbin showed some resistance in the south-west.

Very serious losses to the citrus crop in the Murrumbidgee irrigation area and near the Murray River were caused by *Septoria citricola* [ibid., xvii, p. 742]. Navel oranges showed the most severe infection, but heavy losses were also sustained by Valencia oranges, grapefruit, and lemons. Losses of upward of 50 per cent. of the Navel orange crop occurred generally in the Barooga area, and similar losses were experienced on about one farm in fifteen at Griffith and one in five at Leeton. The disease does not occur in coastal areas.

Grapes nearing maturity are sometimes attacked by ripe rot (*Gloeosporium fructigenum*) [*Glomerella cingulata*: ibid., xvii, p. 726], infection being favoured by insect punctures, wet weather during ripening, and mechanical injuries.

Big bud disease of tomato [ibid., xiii, p. 62] is stated to have appeared on several crops and caused substantial losses. The only method of control considered worth while is that of removing and destroying the affected plants as soon as the disease appears.

Brown patch, attributed to the soil-borne fungi *Rhizoctonia* and *Helminthosporium* [cf. ibid., xvi, p. 468], is the most common disease of home lawns and sports turf in New South Wales. It may, however, be satisfactorily controlled by mercuric chloride-mercurous chloride treatment. An alternative chemical mixture, developed by H. A. J. Pittman, consists of copper sulphate and potassium permanganate (2 oz. of the former and 1 oz. of the latter in 4 gals., the mixture being stirred thoroughly). The affected lawns are first watered by means of sprinklers and when the moisture has drained away, the solution is applied at the rate of 1 gal. per sq. yd., the chemicals being then washed away by water sprinklers to avoid scorching.

Department of Plant Pathology.—*Rep. Del. agric. Exp. Sta., 1938-9* (*Bull.* 220), pp. 33–40, 1939.

This report on plant disease work in Delaware in 1938–9 [cf. *R.A.M.*, xviii, p. 376] contains, among others, the following items of interest. T. F. Manns states that evidence obtained locally demonstrates that plum trees are the chief factor in the spread of peach yellows and little peach. It was also found that *Philaenus leucophthalmus* gave an even higher incidence of yellows infection in limited experimental work than *Macropsis trimaculata*. When the former was fed on virulent yellows and transferred to large peach trees in cages, four trees developed infection, though the controls remained healthy.

The most successful treatments (sprout dip) against *Fusarium* wilt of sweet potato [*F. oxysporum* f. 2 and *F. bulbigenum* var. *batatas*] were improved semesan bel (1 lb. in 10 gals.), mercuric chloride (1 oz. in 8 to 10 gals.), Bordeaux mixture 10–10–50, and a finely divided copper oxide (yellow) carrying a disbursing agent, and used at the rate of 1·2 lb. per 50 gals. In 1938 the last-named material caused less inhibition of growth than the others. In 1936 the controls averaged 64 per cent. wilt, several of the treatments giving only 4 to 5 per cent. wilt; in

1938 the controls averaged 24·8 per cent. wilt, and the better treatments 10·2 to 10·9 per cent.; in 1937 increases [? of yield] due to the treatments ranged from 20·6 to 53·8 per cent.

T. F. Manns and S. L. Hopperstead found that, through greenhouse culture under dry conditions, bacterial leaf spot (*Bacterium pruni*) of peach [ibid., xviii, p. 788] is completely controllable in one season. By this method the disease can be eliminated from nursery stock destined for budding. Using an arid region to eliminate *Bact. pruni* and scab [*Cladosporium carpophilum*: ibid., xviii, p. 785], 30 peach strains were sent to the Yakima district in the early spring of 1937, and grown for one season. In the spring of 1938 the same strains were sent back to Delaware and isolated for a budding source free from *Bact. pruni*. Several years' observations on peach seedlings used for budding indicated that infection by *Bact. pruni* does not come in on the pits or through the wild peach stock; nursery stock is infected directly from the bud used in budding. Locally, bud infection is usually highest in August, when most of the budding is being carried out. The terminal buds are mainly responsible for carrying the disease over in the nursery and in the orchard.

K. J. Kadow, M. W. Goodwin, and S. L. Hopperstead, working in collaboration with the Tobacco By-Products Company, Richmond, Virginia, and the Entomological Department of Delaware University on the interrelation of copper sprays with lead arsenate-lime and fixed nicotines, found that none of the copper fungicides tested can be safely used with fixed nicotine and oil except when lime is added. Fixed nicotines greatly increase the solubility of the insoluble coppers. All the insoluble copper sprays tested with lead arsenate and lime were inferior to Bordeaux mixture for the control of arsenical injury, but caused much less fruit injury and copper leaf burn than Bordeaux mixture.

SMITH (C. O.). **Susceptibility of species of Cupressaceae to crown gall as determined by artificial inoculation.**—*J. agric. Res.*, lix, 12, pp. 919–925, 4 figs., 1939. [Received April, 1940.]

In this paper the author records the results of inoculation experiments in California with *Bacterium tumefaciens* on species of Cupressaceae. Cultures from peach produced galls on *Cupressus*, *Juniperus*, and *Thuja* spp., others from *Salix* sp. produced galls on *Cupressus*, *Thujopsis*, *Juniperus*, and *Thuja* spp., and those from *Libocedrus decurrens* [*R.A.M.*, xvii, pp. 19, 447] gave negative results on all except the original host species. Sixteen species of *Cupressus* were found to be definitely susceptible, viz., *C. arizonica*, *C. bakeri*, *C. benthami*, *C. duttoni*, *C. forbesii*, *C. goveniana*, *C. lusitanica*, *C. knightiana*, *C. macrocarpa*, *C. macnabiana*, *C. nevadensis*, *C. pygmaea*, *C. sargentii*, *C. sempervirens*, *C. thurifera*, and *C. torulosa*. Knob-like growths but no typical galls were produced on *C. glabra* and *C. montana*, and on *C. guadalupensis* all the inoculations gave negative results. Galls were produced on *J. virginiana*, *J. phoenica*, and *J. procera*, but only small, knob-like growths on *J. hibernica* and *J. cedrus*. *L. decurrens*, *Thuja plicata*, *T. occidentalis*, and *T. orientalis* gave ready response. Inoculations of *Thujopsis dolabrata* yielded no infection, but rooted cuttings of this species were

susceptible. *Chamaecyparis lawsoniana* developed non-typical overgrowths.

PASSALACQUA (T.). **Due nuove matrici del Bacterium tumefaciens.** [Two new hosts of *Bacterium tumefaciens*.]—*Lav. Ist. bot. Palermo*, x, 1, pp. 42–46, 2 figs., 1939.

Of a number of ornamentals inoculated at the Milan Serotherapeutical Institute with pure cultures of *Bacterium tumefaciens*, only *Ficus bennettii* and *F. bellengeri* became infected, developing small tumours after a protracted incubation period.

VOELCKER (O. J.) & WEST (J.). **Cacao die-back.**—*Trop. Agriculture, Trin.*, xvii, 2, pp. 27–31, 6 figs., 2 maps, 1940.

This is a report on the authors' investigations into die-back [*R.A.M.*, xvii, p. 224], and dying-out [ibid., xiii, p. 222] of cacao in Nigeria and during a tour through the Gold Coast. In Nigeria, where cacao cultivation is almost entirely confined to the south-western provinces, the following three primary factors are believed to cause die-back: (i) drought, which causes a slow die-back of twigs and branches in trees of all ages, while the leaves wilt, turn yellow, and fall off; (ii) blast, caused by *Sahlbergella* spp.; and (iii) unsuitable soil producing a general debility of growth. Summing up the theories put forward for the cause of die-back in Nigeria, the Gold Coast, Trinidad, and Grenada, the following would appear to be the possible factors: lack of soil moisture during the dry season; excess of soil moisture at certain periods; lack of manure and forking; unsuitability of the soil; and *Sahlbergella* blast. A form of dying-out of cacao, which is distinct from die-back, is stated to be known under the general term 'exposure' in nearly all cacao-growing countries, the possible causes being exposure, soil deterioration, lessening of soil moisture, direct solar effect, further action of the agent causing the original break in the canopy, and ingress of insects. The authors' own observations in the Gold Coast [a detailed account of which is given in an appendix] pointed to the existence of two distinct sets of conditions under which die-back occurs: (i) dry areas with generally less than 55 in. of rainfall, in which the symptoms in both cacao and the secondary vegetation were identical with those associated in Nigeria with drought and in which, with the exception of one heavily shaded farm in a valley, no sign of *Sahlbergella* damage was found; and (ii) wet areas with generally over 55 and mostly over 60 in. of rainfall, in which soil moisture was abundant and *S.* spp. were present on the shoots. It was not established whether other insects apart from *S.* spp. were involved, but the authors are convinced that insect attack was responsible for the actual killing-back of the cacao in the wet areas. It is concluded that die-back in Nigeria is due to three primary causes: drought and lack of soil moisture during dry seasons; blast caused by *S.* spp. associated with wet conditions; and unsuitability of the soil. In the Gold Coast two primary causes seem to be responsible: drought in the dry, and *S.* spp. in the wet areas. Since several factors appear to be responsible for die-back, it would seem that a single control measure could hardly be effective in every case.

Pound (F. J.). **Search for resistance to witchbroom in Cocoa.**—*Proc. agric. Soc. Trin. Tob.*, xl, 1, pp. 35, 37, 1940.

Seeds from cacao trees found in the upper regions of the Amazon and in Ecuador apparently uninfected by witches' broom [*Marasmius perniciosus*: *R.A.M.*, xix, p. 266] were sent to Trinidad, quarantined in Barbados, and then retransferred to Trinidad as budwood for grafting on to local stocks. Of the introductions, some from Ecuador have been at the Marper Estate for over a year; more than 50 per cent. are infected, some severely, others lightly, but many are still healthy. Some of the selected local clones [ibid., xvii, p. 729; xix, p. 261] at Marper have been planted out for two years; most have shown some resistance, and one or two have developed scarcely any infection, though already fruiting.

Mourashkinsky (K. E.). Защита хлебов от болезней в засушливых районах юго-востока. [Control of cereal diseases in the arid districts of the south-east.]—*Омская Область* [*Omsk District*], *1940*, 2, pp. 31–36, 1940.

Discussing the control of diseases of cereal crops under conditions of south-eastern U.S.S.R., the author points out that the arid character of this area is erroneously believed by many to be so unfavourable for disease development that control measures have been relaxed. During 1936 some farms in a district with an average precipitation of 242 mm. showed from 30 to 50 per cent. wheat bunt [*Tilletia caries* and *T. foetens*]. Serious losses are also occasioned by loose smut of wheat [*Ustilago tritici*]. Plants grown from vernalized seeds treated with preparation AB [*R.A.M.*, xv, pp. 785, 788; xix, p. 321] showed a very high rate of infection with bunt on several farms in the area. This chemical should, therefore, not be used in dry districts. Ergot [*Claviceps purpurea*] is prevalent on rye only in some years. It seems that the most widespread form of this disease in zones of desiccation is one in which no sclerotia are formed, the development of the fungus being arrested at the 'honey-dew' stage. Although there is usually a lower incidence of rust than in more humid areas, it is more destructive under arid conditions. Brown rust of wheat (*Puccinia triticina*) is capable of overwintering in the field in spite of adverse conditions and represents a serious cause of infection in summer. Of some importance in dry regions is the seedling wilt of cereal crops caused usually by *Helminthosporium sativum*, or by other *H.* and *Fusarium* spp. The 'pupation' disease [ibid., xix, p. 337] of cereals, which is undoubtedly of Asiatic origin, has not yet been observed in the arid south-east, but is apparently spreading westwards and has already passed the Urals.

Jones (G. H.) & Seif El-Nasr (A. El-G.). **The influence of sowing depth and moisture on smut diseases, and the prospects of a new method of control.**—*Ann. appl. Biol.*, xxvii, 1, pp. 35–57, 11 graphs, 1940.

Further experiments on the effect of planting method on flag smut of wheat [*Urocystis tritici*], wheat bunt (*Tilletia foetens*), covered smut of barley (*Ustilago hordei*), and grain smut (*Sphacelotheca sorghi*) of millet [sorghum] and a millet variety called broomcorn [*R.A.M.*, xviii,

p. 170] again showed the superiority of the afir method. The main difference between the afir and the herati method consists in the following: afir plots, being irrigated immediately after sowing, are wet, and the seed is buried about 4 cm. deep; in herati plots the soil is only moist enough for good ploughing, and the seed is buried with a plough set at 12 to 15 cm. deep, the average depth of seed effectively planted being about 8 cm. The effect of the planting methods on the incidence of smuts was found to be conditioned by two factors, depth of sowing and soil moisture. It is suggested that the marked influence of the first factor is probably due to lengthening of the period in which the seedling is susceptible to infection by deeper planting. A series of theoretical curves of infection plotted against depth of planting (both for the case of solely seed-borne smuts and the complex case of seed and soil inoculum) were drawn on this assumption and proved similar in some degree to the actual curves of observed disease. The influence of wet soil is unfavourable to disease but less marked than that of depth of planting, except perhaps for flag smut, where it is unusually important. The soil moisture effect is very consistent for all diseases and at all depths, and increases with depth, presumably owing to lack of aeration. Under extreme conditions the soil moisture effect becomes so great that it apparently reverses the effect of depth. This is tentatively explained by the fungus becoming destructively parasitic and killing the seedlings in the early stages of infection, before their emergence. This effect is most marked in bunt of wheat and grain smut of broomcorn.

On the basis of these results shallow planting in wet soil is generally recommended for countries where irrigation is practised. Good control of smut diseases was obtained with mud-sowing, a method consisting in broadcasting the seed on the surface of recently flooded land, either previously dry or moist. The results of comparative experiments showed 0·08 to 0·2 per cent. of flag smut in mud-sown plots as compared with 2·4 to 3·2 in the afir, and 8·1 to 8·6 in the herati plots. Limited experience indicates that on heavy soils in most parts of Egypt mud-sowing is practicable and satisfactory, but on other soils new methods should be tried. In the control of grain smut of millet and broomcorn, seed treatment with sulphur is considered so cheap and simple a method, that no other need be sought. On the other hand, no satisfactory disinfectant being yet available against bunt and flag smut of wheat, the best means of control is the application of special planting methods.

Jones (G. H.) & Seif el-Nasr (A. El.-G.). **Control of smut diseases in Egypt with special reference to sowing depth and soil moisture.**—*Bull. Minist. Agric. Egypt* 224, 46 pp., 7 pl., 12 graphs, 1940.

Much of the subject matter dealt with in this bulletin on the control of flag smut of wheat (*Urocystis tritici*), covered smut of barley (*Ustilago hordei*), wheat bunt (*Tilletia foetens*) and grain smut (*Sphacelotheca sorghi*) of sorghum and broomcorn has already been noticed from another source [see preceding abstract]. The mud-sowing method is stated to have the further advantage of inducing excellent germination and early tillering, which probably improves quality and uniformity of grain. There is, however, a danger that under conditions of abnormally rapid surface drying seeds may fail to penetrate the hard soil and

consequently produce poor stands. To prevent this seeds can be coated with mud before sowing in order to make them heavier and thus more capable of penetrating the soil surface and to enable them to absorb more water by fusion of the coating with the soil. In small-scale experiments the following stand figures were obtained for wheat and barley, respectively: dry seed sown on mud, 215 and 90 plants per sq. m., dry seed mud-coated, 386 and 218. Still better results were obtained with seed soaked for 24 hours and then mud-coated (440 and 430 plants per sq. m.), but most farmers consider soaking of seed objectionable. A modified herati method is also described in which the land is deeply ploughed and allowed to lie for five days and the seeds then broadcast and passed over once or twice with a light zahhafa (a wooden baulk), so that they are covered to a depth of 1 to 2 cm.

In an appendix the flag smut [*R.A.M.*, xvi, p. 167] situation in Egypt is surveyed. The disease is stated to be rather uncommon near the Mediterranean coast and in the south at Assiut, but is most serious near the centre of the Delta. The amount of disease in the field varies greatly with the season; the highest figure ever recorded was 58 per cent., but the normal yearly average is very much lower. The presence of 50 per cent. disease in the field is likely to cause a loss of about 20 per cent. in yield. Seed disinfection has not yet given very clear-cut results in Egypt; the best were obtained with copper sulphate dip, which controlled on the average about 30 per cent. infection in herati and about 50 per cent. in afir plots, but frequently depressed the germination in the former. It is thought probable that all Egyptian soil is infected. The results of two large experiments with burning of stubble were insignificant. Phosphate manuring had no effect on the disease.

A second appendix deals with curious abnormalities and twistings observed in barley seedlings grown from dehulled seed. It is shown that this effect was associated with the failure of coleoptiles to burst at the apex, bursting instead at the base. This is probably due to a very rapid intake of water in dehulled seeds and some disorder of the growth system which prevents proper growth of the coleoptile but not of the green shoot within, so that the pressure is abnormally great and often bursts the coleoptile at the base. The addition of 0·25, 0·5, or 1·5 per cent. hortomone (a growth substance) to the seedlings improved the growth of roots and coleoptiles. On the basis of these results it is suggested that the increased susceptibility to smut in dehulled seed observed by other workers [ibid., iv, p. 214] may be due to the longer period of emergence of seedlings, and is a consequence rather than the cause of twisting and other abnormalities of growth.

Boewe (G. H.). **Diseases of small grain crops in Illinois.**—*Circ. Ill. nat. Hist. Surv.* 35, pp. v+130, 1 pl., 47 figs., 1939. [Abs. in *Exp. Sta. Rec.*, lxxxii, 4, p. 501, 1940.]

The six chapters of this monograph deal, respectively, with the nature of cereal, wheat, oats, barley, and rye diseases, and their control. All the important diseases affecting small grains in Illinois are illustrated from photographs and described in detail, with notes on the life-history of the causal organism, its importance in the State, and appropriate control measures.

CRAIGIE (J. H.). **Studies in cereal diseases. XII. Stem rust of cereals.**—*Fmrs' Bull. Canad. Dep. Agric.* 84, 39 pp., 26 figs., 1940.

This is a very comprehensive survey of the available information on stem rust of cereals and grasses (*Puccinia graminis*), with special reference to the conditions governing its development and spread in Canada and North America generally. The life-cycle of the fungus is clearly explained and sections are included on physiologic specialization within the species, the mechanism of hybridization, the relative significance of different sources of infection, and the control of the disease by direct and indirect measures. The bibliography of specially selected references comprises 55 titles.

PETERSON (R. F.), JOHNSON (T.), & NEWTON (MARGARET). **Varieties of Triticum vulgare practically immune in all stages of growth to stem rust.**—*Science*, N. S., xci, 2361, p. 313, 1940.

Of the various wheat varieties tested at the Dominion Rust Research Laboratory, Winnipeg, for resistance to stem rust (*Puccinia graminis tritici*), five varieties received from Kenya, namely, 122. D.I.T. (L), 117. E. 16. B. 1, 117. B. 5. B. 2, 117. K. 16. A. (L), and 117. 1. 5. F. (L) [cf. *R.A.M.*, xi, p. 163; xvi, p. 520], and one local variety, known as McMurachy's Selection, were found to be practically immune at every stage of growth from all physiological races of the rust occurring in Canada. For a number of years these varieties have been artificially infected with about 30 races in the field and have shown only an occasional trace of rust. In the greenhouse, seedlings artificially infected with 20 races of the rust showed no rust pustules, except at abnormally high temperatures when the resistance was found to break down, but occasionally minute flecks were observed. Infection was obtained by injecting uredospores within the leaf sheath, but such infections may be produced on most wheat varieties that are immune in the field.

STAKMAN (E. C.) & HAMILTON (L. M.). **Stem rust in 1938.**—*Plant Dis. Reptr, Suppl.* 117, pp. 69–83, 3 maps, 1939. [Mimeographed. Received May, 1940.]

Both stem (*Puccinia graminis tritici*) and leaf [*P. triticina*] rusts of wheat were epidemic in the United States in 1938 [*R.A.M.*, xix, p. 203], the losses ranging from under 5 to 10 per cent.; oats were equally heavily infected by *P. graminis* (*avenae*) in Oklahoma, Illinois, and possibly Kansas. The stem rust inoculum is believed to have been carried southwards by northerly winds from *Hordeum jubatum* and late oats, which were found infected towards the end of August, 1937, in southern Minnesota, Iowa, and northernmost Missouri. Observations in Southern Mexico in February, 1938, indicated that this region does not ordinarily take part in the interchange of rust from north to south and from south to north, but nine races were found in northern Mexico all of which were subsequently found in the United States. Slide exposures indicated that *P. graminis* spores were in the air as far north as Nebraska during eight periods both in May and June; they were also trapped in large numbers on 9th July in Montana, which usually escapes attack. Physiologic race 56 was predominant during the epidemic, accounting probably for 90 per cent. of the inoculum and constituting 66 per cent.

of the isolates; it was followed by 38, 19, 17, and 11, with 15·5, 6·4, 3, and 2 per cent., respectively. *P. g. tritici* was the most prevalent strain of the rust on barberries, being represented in 78 per cent. of the collections, followed by *P. g. secalis* and *P. g. avenae* in 19 and 12·5 per cent., respectively, race 56 of *P. g. tritici* again preponderating (36·2 per cent. as compared with 9·9, 7·3, 7·3, 6·5, 6·1, 5·3, 4·9, and 4·2 for 38, 36, 17, 19, 34, 21, 49, and 11, respectively).

WRIGHT (L. K.) & KIRBY (R. S.). **Barberry eradication in Pennsylvania.** —*Proc. Pa Acad. Sci.*, xiii, pp. 41–42, 1939.

Since the initiation in 1935 of an intensive barberry eradication campaign against cereal black rust [*Puccinia graminis*] in Pennsylvania under the joint auspices of the Federal and State authorities, a total of 5,411 square miles of territory has been covered (up to 28th February, 1939), comprising nearly 3,000,000 bushes and over 6,000,000 seedlings on 5,712 properties. In 108 fields in the eradication area, the average annual oat yield during the five years immediately preceding the institution of the operations was 16·13 bush. per acre, while in the first season after the start of the campaign it amounted to 42·68 bush. Wheat yields in 11 fields increased from 9·54 to 23·36 bush. per acre. The oats (*avenae*) and rye (*secalis*) forms of the rust are more common and destructive in the State than that of wheat (*tritici*), largely owing to the prevalence of the grasses *Dactylis glomerata* and *Agropyron repens*, which act as hosts of the two former.

SIBILIA (C.). **Le razze fisiologiche di 'Puccinia graminis tritici' Erikss. et Henn. nell' Africa Orientale Italiana.** [The physiologic races of *Puccinia graminis tritici* Erikss. & Henn. in Italian East Africa.]—*Boll. Staz. Pat. veg.*, *Roma*, N.S., xix, 4, pp. 497–508, 1 map, 1939. [Issued March, 1940.]

From wheat procured from 14 different localities in Italian East Africa the author obtained 13 further new physiologic races of *Puccinia graminis* (in addition to the four already found) [*R.A.M.*, xviii, p. 507], designated A.O.I. 5 to 17. All 17 races fell into three groups. The first (A.O.I. 2, 5, 8, 9, 10, 13, 14, 16) consisted of those that produced heavy infection on Little Club or Jenkin wheat and very weak or no infection on Vernal and Khapli; in this group, heaviest infection occurred on Mindum and Kubanka wheats. The races composing the second group (A.O.I. 1, 3, 6, 7, 11, 12, 15, 17) gave strong infection on Little Club, average or strong infection on Khapli, no infection on Reliance, and strong infection on Arnautka, Mindum, Spelmar, and Einkorn. The third group, consisting of A.O.I. 4 alone, gave weak or no infection on Little Club and very heavy infection on Khapli.

Of the ten other physiologic races of *P. graminis* known in Africa, all those from Kenya (17, 21, 34, and 116) [ibid., xiii, p. 361] fall into the first group, while of those from South Africa not found in Kenya (13, 29, 38, 98, 99, and 100) [ibid., xv, p. 6.], the first four fall into the first group, race 100 perhaps also belongs to it, though this race has an indeterminate effect on Vernal, and race 99 most resembles those in the third group.

Races A.O.I. 1 and 5 were found in Amara, races A.O.I. 1, 2, 3, 6, 7, 8,

9, 10, 11, and 12 in Scioa, race A.O.I. 13 in Galla and Sidama, and races A.O.I. 4, 14, 15, 16, and 17 in Harrar.

PAN (C. L.). **A genetic study of mature plant resistance in spring Wheat to black stem rust, Puccinia graminis tritici, and reaction to black chaff, Bacterium translucens var. undulosum.**—*J. Amer. Soc. Agron.*, xxxii, 2, pp. 107–115, 1940.

A tabulated account is given of the writer's studies at the Minnesota Agricultural Experiment Station on the inheritance of reaction to stem rust (*Puccinia graminis tritici*) and black chaff (*Bacterium translucens* var. *undulosum*) in crosses of Marquis × H. 44, III–31–7, and Pentad × Marquis, III–34–1, with Minnesota Double Cross, II–21–80, Hope, and H. 44 [*R.A.M.*, xiii, p. 428].

Resistance to stem rust was apparently dominant to semi-resistance, the data indicating that Marquis × H. 44 carries a single dominant gene allelomorphic to that borne by Hope and H. 44, and that Minnesota Double Cross is the bearer of two complementary factors for semi-resistance similar to those carried by Pentad × Marquis.

Susceptibility to black chaff appeared to be dominant to resistance. There was an incomplete association between resistance to stem rust and susceptibility to black chaff; hybrid plants resistant to both diseases were encountered, but not a single individual susceptible to both was found.

NOLL (W.). **Deformaciones provocadas en los gérmenes del Trigo por los tratamientos de la semilla.** [Deformities induced in Wheat seeds by treatments of the grain.]—*Arch. fitotec. Uruguay*, iii, 1, pp. 86–95, 7 figs., 1938. [English and German summaries. Received April, 1940.]

In laboratory germination tests with nine pedigree wheats at the National Plant Breeding Institute of Uruguay, carried out in sand and on blotting paper, injury to the seedlings in the form of retarded growth or tumour formation on the coleoptiles and roots, resulted from excess treatments against bunt [*Tilletia caries* and *T. foetens*] with ceresan dust (U.T. 1875a), granosan No. 1, uspulun dust, copper sulphate, mercuric chloride, and ceresan liquid (U. 564) [*R.A.M.*, xiii, p. 624: xix, p. 269]. The abnormalities occurred chiefly in the lots treated with ceresan dust and granosan and were shown by intensive histological and cytological studies to resemble those due to the application of colchicin in two respects, namely, (1) the tumours are induced by hypertrophy of the existing cells, not by an increase in their numbers; (2) giant cells, with two to eight nuclei, are nearly always present in the outgrowths. Wheat seeds germinated in colchicin solutions developed with malformations similar to those observed in the dusted lots.

CHURCHWARD (J. G.). **The initiation of infection by bunt of Wheat (Tilletia caries).**—*Ann. appl. Biol.*, xxvii, 1, pp. 58–64, 1 pl., 3 figs., 1940.

In a study on the mode of penetration of wheat by *Tilletia caries*, the coleoptiles of the wheat varieties [Little] Joss (susceptible) and Hussar (resistant) were inoculated with cultures from single and from masses of

secondary basidiospores, and also from chlamydospores. Two types of mycelium developed when secondary basidiospores were used: one was narrow (approximately 1·5 μ in diameter), non-septate, regular in outline, occasionally branched, and not deeply stained by cotton blue or carbol thionin; the other arose as a result of fusion between two narrow hyphae, was thicker (approximately 3 μ in diameter), irregular in outline, and more deeply stained. In it the nuclei were associated in pairs. Hyphal fusion was strikingly rapid. No fusion occurred between the hyphae of a single-spore culture derived from a secondary basidiospore. Attempts to induce hyphal fusion of compatible strains on artificial media of different kinds were unsuccessful. In the process of infection an appressorium was formed from below the 'fusion hypha' at the slight depressions on the surface where the epidermal cells meet, and penetration, which was always intercellular, was accomplished by means of a small peg through the plant cuticle between the epidermal cells. No penetration was observed by the promycelium of the chlamydospores or by mycelia derived from fused primary sterigmata or from single basidiospores, and it is concluded that hyphal fusion is prerequisite for penetration. Immediately after penetration the hypha broadened to form a swollen irregular cell, into which passed the contents of the appressorium. In this cell the nuclei were associated in pairs. Reaching the first cross-wall this enlarged hypha bifurcated to form a narrow, somewhat gnarled, intercellular mycelium, in which the nuclei were no longer associated.

MILLIKAN (C. R.). **The influence of nutrition on the reaction of Wheat to Urocystis tritici Koern. Part III.**—*J. Dep. Agric. Vict.*, xxxvii, 12, pp. 587–596, 8 figs., 1 graph, 1939.

In an account of further experiments on nutritional factors affecting flag smut of wheat (*Urocystis tritici*) [*R.A.M.*, xviii, p. 791], the author describes in detail the symptoms in wheat of deficiency and excess of a number of elements.

A calcium excess of twice the normal dosage significantly increased infection in the Free Gallipoli variety; a four times normal excess had no effect; but severity of attack was increased by combining double calcium with one-fourth magnesium and one-tenth phosphorus. Excess of phosphorus or potassium alone had no effect.

With the Ghurka variety no treatment increased susceptibility to any degree comparable with that of susceptible controls grown under the same conditions. One observation indicated that with this variety development of *Erysiphe graminis* was greatly reduced by deficiency of phosphorus in the plant.

In field tests with Free Gallipoli it was found that considerable variations in the reaction to flag smut were induced by different soil treatments, and these differences were correlated with those induced in the calcium contents. Under the conditions of any particular experiment an optimum concentration of calcium in the plants for the development of *U. tritici* occurred at nine weeks after germination (six in one case). This period is a critical one in the development of infection, as sori consistently first appeared in the tests approximately eleven weeks after germination.

Comparative tests on the effects of soil treatments on reaction to flag smut by the susceptible Free Gallipoli and the resistant Ghurka varieties indicated that the degree of resistance of a wheat variety determines whether such treatments will affect its flag smut reaction, the resistance of Ghurka being significantly increased by a soil treatment that had no effect on the reaction to *U. tritici* of Free Gallipoli.

SABOUROVA (Mme P. B.). Анатомо-морфологические изменения колоса Пшеницы, пораженного **Ustilago tritici (Pers.) Jens.** [Anatomical and morphological changes in Wheat ears infected with *Ustilago tritici* (Pers.) Jens.]—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 111–118, 8 figs., 1939. [Received April, 1940.]

A study made in 1936–7 in Leningrad showed that the striking changes wrought in wheat ears (varieties Albassar and Albidum) by *Ustilago tritici* [*R.A.M.*, xvii, p. 130] become manifest when the third or more usually fourth node is formed; they consist of (*a*) an underdevelopment or complete absence of awns (particularly noticeable in the awned Albassar), (*b*) the appearance of brownish stripes along the whole length of the ear due to accumulation of spores, and (*c*) malformation of the spikelets which are slightly flattened and project from the axis of the ear. The diseased ears of plants showing the third or fourth node are usually larger than those of healthy ones and have fewer spikelets. In earlier stages the mycelium in the ears is sparse and usually intercellular, while later on it spreads, and sometimes becomes intracellular.

MARKEVICZ (N.P.). Перезимовка и поражаемость снежной плесенью экотипов озимой Пшеницы. [The overwintering and susceptibility to snow mould of ecotypes of Winter Wheat].—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 119–121, 1939. [Received April, 1940.]

The world collection of winter wheats of the Pan-Soviet Institute of Plant Protection was tested in 1938 near Leningrad for resistance to snow mould, *Fusarium nivale* [*Calonectria graminicola*: *R.A.M.*, xix, p. 337]. The 750 samples tested, grouped in 19 ecotypes, exhibited great differences in susceptibility. The ecotypes from the north overwintered well and showed little infection, whereas those from the south overwintered badly and were very susceptible to infection. A high negative correlation has thus been established between the ability of the plant to overwinter and the development of snow mould.

SEMENIUK (W.). **Physiologic races of Ustilago hordei (Pers.) K. and S. in Alberta.**—*Canad. J. Res.*, Sect. C., xviii, 3, pp. 76–78, 1940.

Among the 12 collections of *Ustilago hordei* [*R.A.M.*, xvii, p. 308] obtained from widely separated points in Alberta, four (B, F, H, and L) were found in tests made in 1935 and 1937 to differ consistently in their respective ability to infect the barley varieties Colsess, O.A.C. 21, Hannchen, and Trebi, indicating the presence of four distinct physiologic races. In tests in 1938, however, the distinctions between collections F, H, and L had practically disappeared and only collection B again clearly differed from the others in its inability to produce more than slight infection on Colsess. The cause of the sudden change in patho-

genicity remains obscure. It may be that most, if not all, races of *U. hordei* are highly heterozygous with respect to pathogenic qualities. It is also possible that seasonal differences in the environment may have favoured the multiplication of certain biotypes within the collections.

JOHNSON (T.) & NEWTON (MARGARET). **Crossing and selfing studies with physiologic races of Oat stem rust.**—*Canad. J. Res.*, Sect. C., xviii, 2, pp. 54–67, 1 pl., 1 fig., 1 diag., 1940.

In studies on the selfing and crossing of physiologic races 2, 3, 5, 6, 7, 8, and 10a of *Puccinia graminis* of oats evidence was obtained that some races contain both homozygous and heterozygous lines. In the progeny of the selfed heterozygous races 3, 5, and 8, and of the crosses between races 2 and 7, 7 and 10a, 5 and 10a, and 5 and 6, the small pustule type was dominant over the large pustule type. It is concluded that the selfing of heterozygous races tends to produce more virulent strains than the parent race, while crossing tends to produce hybrid races resembling the less virulent of the two parents, both processes indicating that the more virulent characteristics of the rust are recessive. In reciprocal crosses between races 5, 6, 7, 8, and 10a, the hybrid race showed a well-marked tendency to resemble the maternal parent in the type of infection produced on Joanette Strain. This phenomenon is explained on the assumption that each hybrid receives from the paternal race only a nucleus, but from the maternal race both nucleus and cytoplasm. In crosses between races of the normal red and orange uredinial colour [cf. *R.A.M.*, xvii, p. 449], red was invariably dominant. Two selfing studies of race 3, the first with teleutospores about six months old, and the second following a dry storage of the same teleuto material at about 8° to 10° C. for almost five years, showed that a genetic change, probably due to ageing, has taken place in the stored teleutospores. In the first series no abnormality in infection occurred, while in the second only about half of the infections developed pycnidia and pycnidial nectar, the remainder having the appearance of small, round necrotic areas, frequently surrounded by a purple halo, without an indication of any pycnidial formation.

TORRIE (J. H.). **Correlated inheritance in Oats of reaction to smuts, crown rust, stem rust, and other characters.**—*J. agric. Res.*, lix, 11, pp. 783–804, 4 figs., 3 graphs, 1939.

The following results were obtained in field and greenhouse studies on the mode of inheritance of disease resistance and various kernel characters in oats [cf. *R.A.M.*, xix, p. 271], conducted from 1936 to 1938 in Wisconsin. The inheritance of smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) reaction, as indicated by the F_3 distribution of several crosses of oats for percentage of smutted plants, was governed by two factors, one for high resistance, and the other for partial. The segregation for crown rust (*Puccinia coronata*) reaction in the cross Iowa No. 444 × Bond suggested the presence of two factors, S, a factor for resistance, and I, a factor which partly inhibits the expression of S. The masking effect of I was greater in the mature plant in the field than in seedlings in the greenhouse. The reaction of the F_3 seedlings to individual races of *P. coronata* was the same as that obtained when a composite inoculum

was used. The F_1 seedling reaction indicated a partial dominance of resistance to *P. coronata*, whereas the mature plant showed a partial dominance of susceptibility. Generally speaking, the agreement between seedling and mature plant reactions was close. The inheritance of stem rust (*P. graminis*) was governed by a single factor pair, resistance being dominant over susceptibility. The agreement between seedling and mature plant reactions was very close. In the cross Iowa No. 444 × Bond the smut and rust reactions were inherited independently of each other and of the characters earliness, basal articulation, and basal hair length.

DOWN (E. E.) & THAYER (J. W.). **Huron, a new Oat variety for Michigan.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxii, 3, pp. 209–212, 1940.

Full particulars are given of Huron, a prolific, medium-early, yellowish-grained variety of oats, developed at the Michigan Agricultural Experiment Station from a cross between Markton and Victory and characterized by a high degree of resistance to smut [*Ustilago avenae* and *U. kolleri*].

MCNEW (G. L.). **Invasion of Sweet-Corn plants of different ages by strains of Phytomonas stewarti.**—*Phytopathology*, xxx, 3, pp. 244–249, 1 fig., 1 graph, 1940.

In further experiments at the Rockefeller Institute for Medical Research on the effects on 7- to 24-day-old Golden Bantam maize seedlings of inoculation with strains of *Phytomonas* [*Aplanobacter*] *stewarti* of varying degrees of virulence [*R.A.M.*, xix, p. 338], highly virulent strains, such as B-1011, were equally invasive on both young and older plants (up to 31 and 57 days in another series of tests), whereas weakly virulent strains were much more pathogenic to seedlings over 14 days old than to younger ones. The less virulent strains of the bacterium being obligate users of organic nitrogen, it is suggested that compounds of this substance develop in the tracheal tubes after the plant has become established and begun to synthesize its own organic materials.

ELLIOTT (CHARLOTTE) & ROBERT (ALICE L.). **Sectoring in colonies of Aplanobacter stewarti.**—*Phytopathology*, xxx, 3, pp. 276–278, 1 fig., 1940.

Potato dextrose agar cultures of one (3b6) out of five single-cell isolations of *Aplanobacter stewarti* from maize gave rise to pure white sectors in the yellow growth [*R.A.M.*, xvii, p. 517]. No dissociation was observed on beef-peptone agar, but platings on potato dextrose agar from broth cultures yielded colonies nearly all of which showed sectoring. Some of these retained the same colours on subculturing, while others segregated into white and yellow or resumed the typical yellow of the species. From two pure white colonies without sectors only white colonies were obtained. When inoculated into maize and reisolated from the wilt lesions, the white cultures remained white and the yellow formed yellow colonies. The parent culture 3b6 is only weakly virulent in comparison with the strong pathogenicity of the other four, and no evidence was obtained in four tests with the 53 transfers of white or

yellow sectors of any access of infectivity through saltation [ibid., xix, p. 338]. Culture 3b6 also differs from the other four isolates under observation in its alkaline reaction to litmus milk, which persisted in the 53 transfers.

NAUDE (C. P.). **Removal of sooty blotch from Oranges.**—*Bull. Dep. Agric. S. Afr.* 212, 13 pp., 1940.

In bleaching tests conducted in 1937–8 in South Africa in the control of sooty blotch of oranges (*Gloeodes pomigena*) [*R.A.M.*, xviii, p. 796; xix, p. 211], it was found that the addition of 3·2 oz. of soda ash to a solution containing 4 oz. chloride of lime and 2 or 4 oz. boracic acid per gal. water resulted in a high bleaching efficiency which was retained much longer than that of the eusol bleaches. A cheaper solution consisting of equal parts of chloride of lime and sodium bicarbonate proved as effective in bleaching as eusol or eusol-soda ash mixtures. It is suggested that baths containing the bleaching solutions should be kept in a cool place and be preferably constructed of wood or cement, as sunlight, iron, and galvanized iron decompose the solutions very rapidly. In baths constructed of iron or galvanized iron the metal should be protected from the solution by one coat of primer and three coats of a good acid-resistant paint.

WAGER (V. A.). **Alternaria citri and the November-drop problem of Washington Navel Oranges in the Kat River Valley.**—*Sci. Bull. Dep. Agric. S. Afr.* 193, 18 pp., 2 figs., 1939.

Orange trees in South Africa are stated to drop large numbers of their young fruits; those up to 0·4 in. in diameter, designated 'shed fruits', drop with their pedicels still attached, and those over 0·4 in. and up to 1·5 in. in diameter, designated 'dropped fruits', dehisce above the calyx and drop without their buttons. The problem of dropped fruits, which occur during November and December, has been investigated during 1935 to 1937 in the extensive citrus-growing areas of the Kat River Valley in the eastern Cape Province. Fruit counts from individual trees showed that the drop varied from 200 to 500 for trees which subsequently bore 600 to 800 fruits, thus representing a considerable loss in yield. Drop invariably followed three to eight days after a spell of hot weather comprising a shade temperature from 85° to 110° F., relative humidity from 5 to 15 per cent., and dry winds, young out-of-season fruits being affected in the same manner as in-season ones. Fruits most usually affected by drop were those from 0·4 to 1 in. in size. The fungus *Alternaria citri* [*R.A.M.*, xvii, p. 442] being suspected of playing a part in the drop problem, cultures were made of some 3,000 dropped fruits from various localities and the fungus was detected in the navel ends of 20 to 100, most usually about 60 per cent., of all samples. Cultures of green healthy fruits also yielded the fungus in almost the same degree as those of dropped ones, indicating that its presence has no bearing on the cause of the drop. The fungus appeared to enter the fruit shortly after the style has dehisced and the fruit is 0·2 to 0·4 in. in size, and to penetrate as far as the centre of the fruit, but it is not present in the calyx end. Trees sprayed with Bordeaux mixture (4–4–50), lime-sulphur (1–60), or zinc sulphate and lime (10–5–100) five times

during the season at weekly intervals showed no improvement over the unsprayed controls, nor did the application of three additional heavy doses of nitrogen to trees normally receiving heavy applications of nitrogen prevent drop. Internal discoloration of the navel end found in some dropped fruits was also found in healthy green ones and does not seem to be correlated with drop. Other fungi were also present in both dropped and healthy green fruits, the most common being *Fusarium lateritium* and *Colletotrichum gloeosporioides*. The drop is considered to take place as a result of hot, dry weather with strong winds, and it is suggested that planting of a cover crop, such as clover, between the citrus trees would increase the humidity of the air on hot days and thus reduce the effects of adverse weather conditions.

CIFERRI (R.) & REDAELLI (P.). **Segnalazione dello Sporendonema epizoum (Cda) Cif. et Red. su frutti di Dattero in Libia.** [Report of *Sporendonema epizoum* (Cda) Cif. & Red. on Date fruits in Libya.]—*Mycopathologia*, ii, 3, pp. 162–163, 1940.

The authors state that they observed *Sporendonema epizoum* [*R.A.M.*, xvi, p. 385; xvii, p. 321] on dates purchased in Florence and said to have been grown in Libya. The fungus formed punctiform, pulvinate-hemispherical, chocolate- to snuff-coloured, almost velvety, isolated, occasionally confluent colonies 1 to 1·5 (rarely up to 2) mm. in diameter. Only a few fruits in the packet were affected. The validity of the genus *Sporendonema* is maintained and 16 synonyms of *S. epizoum* are listed including *Torula epizoa* [loc. cit.; see also ibid., xi, p. 241], *Hemispora stellata* [ibid., xvii, p. 38], *Oospora d'agatae* [ibid., xvi, p. 385], *T. fuliginea* [ibid., viii, p. 66], and *T. pulchra* [ibid., xiii, p. 700].

GILLETT (S.). **Report on a visit to the Coffee growing centres in Jamaica, Costa Rica, and Colombia.**—*Mon. Bull. Coffee Bd Kenya*, vi, 2, pp. 24–27; 3, pp. 40–42, 10 figs., 1940.

Among the diseases observed by the writer in a tour of inspection of the coffee plantations of Jamaica, Costa Rica, and Colombia were *Cercospora coffeicola* (in all three countries), *Omphalia flavida* (in Costa Rica and Colombia, serious in the former), *Rosellinia* root rot (in Costa Rica and Colombia, very destructive in the latter country, where two species appear to be concerned), *Pellicularia* [*Corticium*] *koleroga* (in Costa Rica), and *Colletotrichum coffeanum* [*Glomerella cingulata*] (in Colombia).

MAYNE (W. W.). **Coffee leaf disease attacks in 1940.**—*Plant. Chron.*, xxv, 3, p. 53, 1940.

As a result of prolonged dry weather in 1938–9 and dry conditions during the hot months in 1939, attacks of coffee leaf disease [*Hemileia vastatrix*: *R.A.M.*, xviii, p. 735] in 1939 were exceptionally light in most parts of Mysore and Coorg. The coffee, early in 1940, was consequently very full of leaf, but there was also a considerable amount of late infection, much of it unlikely to be eliminated by leaf fall during dry weather. It is urged that every effort should be made to carry out complete spraying programmes during the hot season in order to reduce the risk of severe attacks likely to result from the heavy carry-over of lightly infected leaf from the late and comparatively light attacks in 1939.

Mayne (W. W.). **The possibility of reducing the strength of Bordeaux mixture for the control of Coffee leaf diseases.**—*Plant. Chron.*, xxxv, 5, pp. 95–97, 1940.

To ascertain whether Bordeaux mixture when used at concentrations weaker than 2–2–40 would give adequate control of coffee leaf disease [*Hemileia vastatrix*: see preceding abstract], an experiment was carried out in southern India in which coffee which had received a uniform 2–2–40 spray in the hot weather of 1939 was sprayed (on 25th and 26th October, 1939, after the south-west monsoon) with Bordeaux mixture 1–1–40, $1\frac{1}{2}$–$1\frac{1}{2}$–40, and 2–2–40. Statistical analysis of the results showed a significant difference between the 2–2–40 strength and the others, and it is concluded that use of the weaker concentrations entails some risk of reduced efficiency. The use of a weaker spray than 2–2–40 is not recommended for the hot weather application.

With reference to the present need for economy, it is pointed out that to spray at a reduced strength is probably better than not spraying at all, and that the use of a weaker spray may give better results than reducing the acreage treated.

Dick (J. B.). **Fertilizers in relation to incidence of wilt as affecting a resistant and a susceptible variety [of Cotton].**—*Proc. Ass. Sth agric. Wkrs*, xl, p. 68, 1939. [Abs. in *Chem. Abstr.*, xxxiv, 8, pp. 2513–2514, 1940.]

The incidence of wilt [*Fusarium vasinfectum*] reached a maximum, with a correspondingly reduced cotton yield, in the absence of potash [*R.A.M.*, xvi, p. 156], increasing amounts of which diminished the amount of infection, but when applied in excess (600 lb. 6–8–16 fertilizer per acre) greatly lowered yields in the resistant cotton variety, while not appreciably affecting those of the susceptible one. Nitrogen and potash, singly or in certain combinations, effectively reduced wilt and augmented yields, whereas phosphate, especially in the absence of nitrogen and potash, increased the incidence of infection.

Tharp (W. H.) & Wadleigh (C. H.). **The effects of nitrogen source, nitrogen level, and relative acidity on Fusarium wilt of Cotton.**—*Proc. Ass. Sth agric. Wkrs*, xl, pp. 190–191, 1939. [Abs. in *Chem. Abstr.*, xxxiv, 8, pp. 2514, 1940.]

In greenhouse sand-nutrient experiments a highly significant increase in cotton wilt (*Fusarium*) [*vasinfectum*: see preceding abstract] was associated with heavy applications of nitrate and an even greater one with similar doses of ammonia. Susceptible plants supplied with the high nitrate solution at $P_H 8$ were less severely diseased than at either 6 or 4, whereas the opposite was the case with ammonia.

Wright (E.). **First progress report on the Phymatotrichum root rot losses in experimental windbreaks of Oklahoma and Texas.**—*Plant Dis. Reptr*, xxiv, 1, pp. 13–20, 1940. [Mimeographed.]

During 1939, some 27 miles of experimental windbreaks planted in Oklahoma and Texas were inspected for root rot due to *Phymatotrichum omnivorum* [*R.A.M.*, xviii, p. 674]. Of the total mileage, about seven

miles were critically examined, detailed notes being made on the losses of the different species. The evidence obtained [which is tabulated] demonstrated that *Ailanthus altissima* showed nearly 100 per cent. survival in a locality where severe infection was present. *Juglans nigra*, *J. major*, soapberry (*Sapindus drummondii*), and apricot also showed resistance. It would appear that no species that can be used in windbreaks on infected soil will prove to be immune. In general, seedlings are more susceptible than older trees.

HASKELL (R. J.) & BARKER (H. D.). **Cottonseed treatment.**—*Leafl. U.S. Dep. Agric.* 198, 8 pp., 3 figs., 1 diag., 1940.

This is a popular note on the control of seed-borne diseases of cotton, with special reference to anthracnose [*Glomerella gossypii*: *R.A.M.*, xix, p. 212] by seed treatment with 2 per cent. ceresan (3 oz. per bush.) or new improved ceresan (1½ oz.) [ibid., xix, p. 146]. The cost of the two preparations is estimated at 9½ to 14 cents for ceresan and 5 to 7 for new improved, and the outlay per acre, at a sowing rate of 5 pecks, at 12 to 24 cents (inclusive of labour). The North Carolina Extension Service estimated that the average net profit per acre from seed disinfection on 43 farms in 1936 was $13.05 and on 100 in 1937 $11.27. In that State disinfectant treatment was practised over some 600,000 acres in 1939 as compared with 2,000, 7,000, 24,000, 200,000, and 450,000 in 1934, 1935, 1936, 1937, and 1938, respectively. Directions are given for the construction of a home-made treating machine from a rotating barrel or oil-drum mixer, while for large-scale use satisfactory power-driven automatic appliances, capable of handling up to 60 100-lb. sacks per hour, are available on the market.

GOIDÀNICH (G.). **L' 'Aspergillus alliaceus' Thom et Church isolato da capsule di Cotone coltivato in Sicilia.** [*Aspergillus alliaceus* Thom & Church isolated from Cotton bolls grown in Sicily.]—*Boll. Staz. Pat. veg., Roma*, N.S., xix, 4, pp. 488–496, 1 pl., 3 figs., 1939. [Issued March, 1940.]

In 1938, the author isolated *Aspergillus alliaceus* [*R.A.M.*, xvii, p. 325] from Sicilian cotton bolls. Infection was general throughout the carpellary column and extended to the carpels. The part of the fibre in which mycelium was present was light yellow, indurated, and mummified. A full description of the morphology of the fungus is given and experimental inoculations of its natural host, garlic, are stated to have produced slow but serious infection, which was clearly favoured by high humidity.

BOTERO (R. O.). **La stenosis: un achiciamento y arrugamiento del Algodón.** [Stenosis: a stunting and rugosity of Cotton.]—*Publ. Min. Econ. nac. Colombia*, 16 pp., 6 figs., 1940.

Information is presented on the occurrence of cotton stenosis [*R.A.M.*, xv, p. 717] in Colombia, where the UA-83 variety appears to be the most resistant. The Malvaceae *Sida acuta* and *S. salvaefolia*, both of common occurrence in the vicinity of affected plantings, show malformations of a similar type to those observed on cotton and may be hosts of the same pathogenic agent.

HEIM (R.). **Les champignonnières des Termites et les grands champignons d'Afrique tropicale.** [The mushroom beds of Termites and the large mushrooms of tropical Africa.]—*Rev. Bot. appl.*, xx, 222, pp. 121–127, 1940.

The author, after describing the development of fungi in the nests of termites, states that these fungi grow simply because the conditions are favourable, without any direct connexion with the insects. While hitherto only three Agarics have been recorded as termite-nest fungi in Africa, he found about a dozen species in the course of a visit to the Ivory Coast. These included edible species with pilei up to 30 cm. in diameter.

Many fungi regarded as strictly terrestrial were observed in equatorial forests to be growing on wood. Further, practically all the fleshy fungi noted in tropical and equatorial forests showed in the pileus a very thin flesh, while the gills tended to be few and thick. Fungal forms specifically related to European fungi, such as *Armillaria mellea*, *Clitocybe nebularis*, *Collybia maculata*, and *Marasmius longipes* were observed with a pelliculose pileus and lamellae less dense than in Europe.

MAINS (E. B.). **Cordyceps species from British Honduras.**—*Mycologia*, xxxii, 1, pp. 16–22, 2 figs., 1940.

The following are recorded in this list of species of *Cordyceps* [*R.A.M.*, xviii, p. 798] collected during 1936 in British Honduras: *C. amazonica* on cockroaches, which differs from *C. blattae* described by Petch [ibid., iv, p. 167] in a number of important respects, especially in having clavate asci and fusoid ascospores; *C. curculionum* on adult *Curculio* beetle; *C. elongata* on a larva of a Lepidopterous insect in a cocoon; *C. submilitaris* on large larvae of beetles in rotten logs; *C. belizensis* n.sp. [with a Latin diagnosis] on a larva of a Lepidopterous insect; *C. sphingum* on mature *Sphinx* moth; and *C. viperina*.

HANSON (H. S.). **Ecological notes on the Sirex wood wasps and their parasites.**—*Bull. ent. Res.*, xxx, 1, pp. 27–65, 6 pl., 1939.

In connexion with ecological studies on the wood wasp *Sirex noctilio* and its parasites, in progress at the Farnham House Laboratory, Imperial Institute of Entomology, since 1927, it is mentioned that entomogenous fungi play no part in the control of *Sirex*, but that *Armillaria mellea* and *Fomes annosus*, which cause the death of trees (silver fir [*Abies alba*] in North Devon, are of considerable importance in that they provide an attractive breeding-ground [cf. *R.A.M.*, xix, p. 213]. Apart from this specific purpose, however, sound, freshly felled timber is preferred by the wasps, and wood actually permeated by fungal mycelium does not afford a suitable habitat for their subsequent development.

THOM (C.). **Naming molds.**—*J. Wash. Acad. Sci.*, xxx, 2, pp. 49–64, 1940.

In this paper the author discusses some of the problems facing the student of the co-called common moulds. He indicates the importance of critical observation and exact descriptions, and emphasizes the

essential value of correct nomenclature and identification, which is too often overlooked or even scouted by workers in applied mycology. As an example of a current problem of nomenclature, the author cites the synonymy of *Phialophora verrucosa* Medlar, described under this name in 1915. In 1920, a similar organism isolated at São Paulo by Pedroso and Gomes was referred to *P. verrucosa*, which has since been commonly cited as originated by Thaxter. In 1921, Brumpt renamed the São Paulo fungus *Trichosporium pedrosoi* Brumpt, and in 1922 he again renamed it *Hormodendrum pedrosoi*. In 1922, again, Terra, Torres, da Fonseca, and Areo de Leão in Rio de Janeiro transferred the same organism to *Acrotheca* as *A. pedrosoi* [*R.A.M.*, iii, p. 289]. In 1928, Ota distributed material under the same *T. pedrosianum*, but decided not to publish this name. In 1929, Ota's mould was assigned by Langeron to *T. pedrosoi* (Brumpt, 1921) [ibid., viii, p. 645]. In 1930, da Fonseca and Areo de Leão adhered to the name *A. pedrosoi* [ibid., xi, p. 645]. In 1935, Dodge transferred the species to the genus *Gomphinaria*. In 1936, Negroni named the fungus *Fonsecaea pedrosoi* (Brumpt) Negroni [ibid., xvi, p. 460]. In 1937, Moore and De Almeida, after collecting and comparing strains, added three more generic names (*Botrytoides*, *Hormodendroides*, and *Phialoconidiophora*) for the variations studied [ibid., xvi, p. 251]. In 1939, Briceño-Iragorry proposed a new generic name, *Carrionia* [ibid., xix, p. 278], with *C. pedrosoi* (Brumpt) Briceño-Iragorry as its type species, and expressed the view that this genus should include the fungus causing chromoblastomycosis in South America.

In 1928, Lagerberg, Lundberg, and Melin, working on forest pathology, found species with the sterigmatic cups characteristic of *Phialophora* on woody material in America and Sweden, and proposed the generic name *Cadophora* [ibid., ix. p. 77] for these forms, without observing their essential identity with *Phialophora*. Since then, morphological and serological comparison of materials from human and forest sources in culture has been found to support the identity of these genera, *Cadophora* 1928 thus giving way to *Phialophora* 1915 [ibid., xvii, p. 178]. The evidence, however, would seem against man-to-man communication of plant-inhabiting fungi, and if it is proved that these organisms belong to species found regularly on decomposing plant remains, occasional human infection from such plant material will not warrant the establishment of a genus or a species for that organism as a parasite. As the identity of *Hormodendrum* with *Cladosporium* has been conceded for 50 years, the rules of nomenclature relegate *Hormodendrum* to synonymy. Hence, the author considers that the chromoblastomycosis fungi must be assigned to *Cladosporium* unless adequate characters are available for separation into one or more other genera. Most workers agree that all the strains in question are closely related. Three kinds of spore production have been found, (1) the *Cladosporium* or *Hormodendrum* type of branching chains in which the newest cells constantly develop at the tips of the branches, (2) the type in which there is progressive reduction of the branching system to clusters of primary spores densely aggregated about the clavate ends of the fertile hyphae, and (3) the type described for *Phialophora*.

The author has studied in culture the *Cadophora* type of structure

from decaying plant material, and kept 20 cultures of strains of *Phialoconidiophora*, *Hormodendrum*, and *Botrytoides* under observation for two months, but found no reason for placing these fungi in different genera. If the strains from human sources can be segregated in a distinct genus, priority demands that *Phialophora verrucosa* Medlar should be the name.

CARRIÓN (A. L.). **Estudio micológico de un caso de micetoma por Cephalosporium en Puerto Rico.** [A mycological study of a case of mycetoma caused by *Cephalosporium* in Puerto Rico.]—*Mycopathologia,* ii. 3, pp. 165–170, 2 pl., 1940.

A description is given of a species of *Cephalosporium*, which is not identified, isolated from a 'Madura foot' [*R.A.M.*, xvii, p. 111] in Puerto Rico. The only other species of the same genus, *C. recifei*, recorded in connexion with this disease from Brazil [ibid., xiv, p. 170], is distinct from the fungus under investigation.

DE ALMEIDA (F.). **Study of a black grain mycetoma due to Actinomyces paraguayensis Almeida, n.sp.**—*Mycopathologia,* ii, 3, pp. 201–203, 2 pl., 1940.

From a thoracic mycetoma with heavy, dark grains affecting a Canadian patient living in Paraguayan Chaco the author isolated a fungus which on Sabouraud's glucose agar formed a pseudomembranous colony with a raised, dark centre surrounded by a white band, progressively increasing in size, and then by a light chocolate area. The fungus is named *Actinomyces paraguayensis* Almeida, n.sp. [with a Latin description of the colonies].

FRANKLIN (G. C. H.). **Actinomycosis: a new species, pathogenic for Man.**—*Ann. intern. Med.*, xiii, 7, pp. 1205–1213, 3 figs., 1940.

An *Actinomyces*, described [without a Latin diagnosis] as a new species under the name of *A. moormani*, was isolated from the pus of multiple molar abscesses in a 41-year-old male patient at the Dental Clinic, Fort Leavenworth, Kansas.

FIGUEROA (H.) & CONANT (N. F.). **The first case of tinea imbricata caused by Trichophyton concentricum Blanchard 1896 reported from Guatemala.**—*Amer. J. trop. Med.*, xx, 2, pp. 287–301, 8 figs., 1940.

From the skin of a 20-year-old female Indian native of Guatemala suffering from tinea imbricata the writers isolated *Trichophyton concentricum* [*R.A.M.*, xviii, p. 678] on Sabouraud's glucose agar, this being the first record of the disease for the country. The microscopic aspect of the cultures (which produced cerebriform, brownish colonies with wide edges radially furrowed and covered with a short, white aerial growth) resembled that commonly ascribed to *Achorion*. The centre was occupied by swollen, torulose, short-celled hyphae of variable diameter, portions of which were filled with protoplasm, leaving deeply staining, large, swollen, or irregularly shaped cells giving rise to chlamydospores or large, hyaline, swollen bodies. Short lateral branches were prominent, and short, rapidly branching lateral hyphae arose from coarser,

amorphous filaments. Irregularly branching elements were observed at the edge of the culture, and in older portions of the growth the hyphae broke up into short-celled segments producing arthrospores.

From a critical study of the relevant literature it is concluded that the following species, among others, should be reduced to synonymy with *T. concentricum* (Blanchard, 1896): *Endodermophyton tropicale* Cast., *E. roquettei* Fonseca, *Mycoderma roquettei* Vuillemin, and *Achorion indicum* [ibid., xiv, p. 35]. The genus *Endodermophyton* should be discarded and species hitherto classified therein transferred to *Trichophyton*.

PECK (S. M.). **Symposium on allergic dermatoses.**—*J. Allergy*, xi, 3, pp. 309–314, 1940.

This is a review of some recent advances in the study of allergy as related to the development of fungus eruptions, with special reference to the two main groups of 'trichophytids' (*Epidermophyton* and *Trichophyton* spp.) and 'levurids' (*Monilia* [*Candida*] spp.), and to the therapy of disorders of the former group by means of trichophytin. The paper, presented at the 17th annual meeting of the American Society for the Study of Allergy in May, 1939, was followed by a discussion (pp. 314–318).

GHOSH (L. M.) & MAPLESTONE (P. A.). **Epidermophytosis in a very young child.**—*Indian med. Gaz.*, lxxv, 2, p. 95, 1 fig., 1940.

Epidermophyton floccosum was recently isolated in pure culture from ring-shaped patches on the right shoulder of a seven-month-old female Hindu infant at the Calcutta School of Tropical Medicine, this being the first record within the authors' experience of ringworm of the glabrous skin in such a young child.

CASTELLANI (A.). **Mycotic eczematous dermatitis of the toes due to Geotrichum rotundatum Cast. 1911, and Geotrichum rotundatum var. gallicum n.v.**—*J. trop. Med.* (*Hyg.*), xliii, 6, pp. 79–81, 5 figs., 1940.

The author has recently encountered [? in London] two cases, both of long standing, of interdigital eczematous dermatitis of the feet, one believed to have been contracted in India and the other in the South of France. The former is attributed to *Geotrichum rotundatum* Cast. 1911 [*R.A.M.*, xix, p. 93], and the latter to a new variety (*gallicum*) of the same fungus [no Latin diagnosis], differing from the type in its smaller hyphae (1·5 to 3·5, average 2 μ), and failure to acidify or clot milk. *Candida zeylanoides* [ibid., xix, p. 151] was also present in the second case, and may have been of etiological significance.

PARSONS (C. G.). **Stomatitis in childhood.**—*Arch. Dis. Childh.*, xv, 81, pp. 43–54, 1940.

Monilia [*Candida*] *albicans* was isolated from 41 out of 60 cases of stomatitis in children under two, and from 10 out of 39 in those between two and ten years old at the Birmingham Children's Hospital in 1938.

ELISEI (F. G.). **Malbranchea Sacc. considerato come un nuovo genere di dermatophytes.** [*Malbranchea* Sacc. regarded as a new genus of dermatophytes.]—*Boll. Soc. ital. Biol. sper.*, xv, 2, pp. 331–332, 1940.

The recent discovery by the author of a *Malbranchea* [cf. *R.A.M.*, xix., p. 150] on dying rice plants at the Pavia Botanical Institute led to a morphological study of the available herbarium material of the few species of the genus known, the results of which showed that, contrary to the statements of other workers, it comprises all the organs proper to the dermatophytes, namely, racquet mycelia, intercalary, apical, and lateral aleuroconidia, arthro- and chlamydospores, pectinate hyphae, nodular organs, spirals, and spindles.

FOUTS (E. L.). **Effect of lactic acid on the hydrolysis of fat in cream by pure cultures of lipolytic micro-organisms.**—*J. Dairy Sci.*, xxiii, 4, pp. 303–306, 1940.

The growth of *Oidium* [*Oospora*] *lactis* [*R.A.M.*, xviii, p. 595] was somewhat restrained in the writer's experiments at the Oklahoma Agricultural College by the addition of butter culture organisms to cream, and definitely inhibited by the introduction of an excess of lactic acid.

MASSEY (L. M.) & LONGRÉE (K[ARLA]). **Black mold disease of Rose grafts.**—*Flor. Exch.*, xciii, 18, p. 17, 1 fig., 1939. [Abs. in *Exp. Sta. Rec.*, lxxxii, 4, p. 503, 1940.]

A note is given on black mould of rose grafts at Cornell University, due to *Chalaropsis thielavioides* [*R.A.M.*, xiv, p. 801], not hitherto reported on the host in question.

THOMAS (H. EARL) & MASSEY (L. M.). **Mosaic diseases of the Rose in California.**—*Hilgardia*, xii, 10, pp. 647–663, 6 figs., 1939.

Three distinct mosaic diseases of the rose [*R.A.M.*, xiv, p. 363] have been observed in central California and are designated rose mosaics 1, 2, and 3. So far, the first appears to be the principal disease of roses grown under glass, and the other two more common on those grown in the open. In addition, roses were infected by inoculation with apple mosaic [ibid., xvi, p. 687] and Winters peach mosaic [see below, p. 417].

Rose mosaic 1 produces small, chlorotic spots, angular or fringed, with clearing of the small adjacent veins, the leaf blade being more or less distorted and marked occasionally by pale bands or lines. On the four common stocks *R. chinensis* var. *manetti*, *R. multiflora*, *R. odorata*, and Ragged Robin symptoms are usually mild; blossoms of the top varieties may either be normal or severely dwarfed, pale, and of little commercial value. The symptoms produced by rose mosaic 2 are generally more conspicuous than those of mosaic 1; in the varieties Belle of Portugal, Cecile Brunner, Hollywood, and Independence Day it is characterized by chlorotic lines, bands, and broad blotches in the leaf blade with or without distortion, the plants being somewhat dwarfed in some cases and normal in others, and the blossoms normal. Mosaic 3 produces symptoms on the four common stocks which are similar to those of mosaic 2 but more severe, causing in some cases

distinct dwarfing, and showing more tendency towards broad chlorotic blotches and few lines and rings, with occasionally a conspicuous oak-leaf pattern and clearing of the veins of some leaves. Rose mosaic 1 can be readily distinguished from the other two by the symptoms alone and its failure to produce definite symptoms on Cecile Brunner and Independence Day. The separation of mosaics 2 and 3 is more difficult, since both of them and the mosaics of apple and peach may produce similar symptoms on roses. However, under comparable conditions they can be distinguished on varieties Hollywood and Belle of Portugal by the symptoms alone, mosaic 3 producing on the latter short, necrotic lines or bands along the midvein, considerable distortion of the leaf blade, and after becoming systemic, largely chlorotic symptoms, while no such reaction was obtained with mosaic 2 or apple mosaic. The variety Souvenir de Claudius Pernet, one of the most susceptible to mosaic 3, failed to develop symptoms of mosaic 2 up to 18 months after inoculation.

The characteristic feature of apple mosaic is the extremely slow rate of development in the rose, 20 to 27 months being required for the development of symptoms 6 in. below the point of inoculation. The Winters peach mosaic may be separated from rose mosaics 2 and 3 by the difference of symptoms in Hollywood and Ragged Robin and the failure of the two rose mosaics to infect peach. In preliminary trials with rose mosaic 1 the stock did not seem to influence the severity of the disease in the scion variety, but Belle of Portugal affected by mosaic 2 and grown on its own roots showed less severe symptoms than when grown on Manetti and Ragged Robin rootstocks. All these mosaics may fail to induce symptoms in some or all of the leaves of an affected plant at any given time; mosaic 1 is often masked for considerable periods in root-stocks. Some observations indicate that the use of buds from diseased plants might be an important means of spread of the viruses. When infected rose cuttings were exposed to heat under various conditions, the virus of mosaic 1 survived exposure to 30° (26 days), 36° (14 days), and 45° C. (30 minutes), but many of the cuttings died; the virus of mosaic 2 withstood exposure at 30° for 11 days.

Cadman (C. H.). **Graft-blight of Lilacs.**—*Gdnrs' Chron.*, cvii, 2768, p. 25, 1940.

In connexion with observations from 1936 to 1938 on 'graft blight' of lilacs in England, the writer draws attention to K. S. Chester's studies on an analogous disturbance in the United States [*R.A.M.*, x, p. 599], the cause in both countries presumably being incompatibility between the scion and the stock (privet in the English cases). The symptoms of the trouble include swelling of the base of the scion, accompanied by a tendency for the bark to over-roll the stock, yellowing, and thickening and brittleness of the foliage, leaf roll, premature defoliation, and general malformation of the bushes, all the symptoms becoming progressively more acute from year to year.

Smith (K. M.). **Graft-blight of Lilacs.**—*Gdnrs' Chron.*, cvii, 2778, p. 144, 1940.

The writer states that a lilac disease with symptoms exactly similar

to those described under the name of 'graft blight' [see preceding abstract], but due in this instance to a graft-transmissible virus, is at present under investigation at the Plant Virus Research Station, Cambridge.

BRIERLEY (P.). **Prevalence of Cucumber and Tulip viruses in Lilies.**—*Phytopathology*, xxx, 3, pp. 250–257, 2 figs., 1940.

In investigations conducted at the United States Horticultural Station, Beltsville, Maryland, *Lilium formosanum* was found to be a satisfactory index plant for the tulip virus latent in lilies of certain species [*R.A.M.*, xvii, p. 41]. Symptoms on this host were recognizable 10 to 14 days after inoculation by rubbing the young leaves, whereas tulips inoculated with juice by hypodermic needle did not develop them until the following year. Of the seven varieties of Easter lilies tested, White Queen was the only one to remain free from infection, suggesting the extreme probability of the presence of the latent tulip virus in most commercial Easter lilies from all sources. On the other hand, six greenhouse-grown seedlings tested virus-free on both tulip and *L. formosanum*.

Combining Price's use of Turkish tobacco for the demonstration of cucumber virus in lilies [ibid., xvi, p. 615] with the above-mentioned *L. formosanum* test, a method entailing the simple mechanical inoculation of these two plants was used as an index of the occurrence of cucumber and tulip viruses in lilies [ibid., xix, p. 349]. Juice from the hybrid George R. Creelman lily, a carrier of both viruses, was applied to the young leaves, previously abraded by carborundum. If symptoms appeared after 4 to 6 days in tobacco (white, necrotic rings, sometimes followed by systemic mottling), a cucumber virus, probably, but not certainly, *Cucumis* virus 1, was considered to be present, while yellowing and curling of *L. formosanum* leaves after 6 to 10 days, succeeded by mottling of various types, denoted the development of a tulip virus. If both plants responded, the indexed plant was regarded as a carrier of the two viruses. During the summer of 1939 this technique was applied to garden lilies of a number of species and varieties from different localities in the United States and from Ottawa. The tulip virus was detected in 31 out of 41 species or varieties of lilies indexed from 13 out of 15 localities (including Ottawa), and that of cucumber in 18 from 9 districts (once from Ottawa). Both viruses were harboured by plants of 14 species or varieties from 7 localities, including *L. auratum*, *L. superbum*, *L. regale*, *L. sargentiae*, *L. tigrinum*, and *L. umbellatum*. Of the bulb-propagated species tested, 6 samples of *L. candidum* carried the tulip virus, 2 both viruses, and 10 of recent seed origin were healthy. All five samples of *L. elegans* were vectors of the tulip virus. *L. tigrinum* carried the tulip virus nine times and both viruses once, while 8 samples from 7 localities were free from infection. Two samples of *L. umbellatum* were apparently healthy while *L. hansoni* and its hybrids with *L. martagon album* (Marham and Backhouse) was uniformly virus-free in tests with 50 plants from 5 localities. *L. myriophyllum superbum* and *L. nepalense*, grown in a greenhouse from wild bulbs of Indian origin, were also sound.

Among the conclusions arising out of these data may be mentioned the satisfactory results of systematic attempts at the avoidance of

mosaic by isolation. *L. hansoni* and its hybrids would appear to be definitely resistant to the disease, or equipped with some property facilitating escape from it. The high level of performance of doubly infected *L. candidum*, George C. Creelman, *L. regale*, and *L. sargentiae* indicates the absence of any close correlation between double infections and lack of vigour.

McWhorter (F. P.). **The distribution of zilverblad or white streak in Narcissus plantings on the west coast.**—*Plant Dis. Reptr*, xxiv, 1, pp. 20–24, 1940. [Mimeographed.]

Test plots maintained in Oregon for three years and mild forcing tests have shown that the white streak symptoms ('zilverblad' in Holland) developing on *Narcissus* [*R.A.M.*, xix, p. 96] are the end expression of obscure white or purple streaks, both of which may appear on the same plant. Such plants, if subjected to rather high temperatures during the growing period, either out-of-doors or in the greenhouse, become typical white-streak plants. Thus, white streak is the chief and final symptom of the disease complex previously referred to by the author as 'decline disease' [ibid., xvii, p. 684]. Evidence obtained independently at Cornell and in Oregon showed that the disease is transmissible and probably of virus origin.

As the condition causes bulb stocks to 'run out', it is of considerable economic importance. It induces very early maturity, the plants ripening shortly after blooming and the normal growth period of the bulb thus being circumvented. The distribution of the disease among the *Narcissus* varieties cultivated on the west coast of the United States from Santa Cruz to northern Washington is described and tabulated. Of the large trumpet varieties 69 per cent. showed the disease while only 12 per cent. of the varieties representing all the other groups exhibited typical symptoms. The disease appears to be of comparatively recent origin, the King Alfred variety, introduced in 1899, being the oldest variety that exhibited significant infection in every lot examined.

Weiss (F.). **Ovulinia, a new generic segregate from Sclerotinia.**—*Phytopathology*, xxx, 3, pp. 236–244, 3 figs., 1940.

Latin and English diagnoses are given of *Ovulinia azaleae* n.g., n.sp., the agent of a destructive flower blight of *Rhododendron mucronatum*, *R. pulchrum*, *R. simsii*, *R. obtusum*, and *R. catawbiense* in the southern and south-eastern United States, and experimentally pathogenic to a wider host range, including *Kalmia* [*latifolia*] and *Vaccinium* spp. [*R.A.M.*, xiv, p. 365; xviii, p. 742].

The fungus is characterized by stipitate, urceolate to cyathiform, flat, tawny olive to snuff-brown apothecia, 2 to 5 mm. in breadth, with a scaly, granulose, or hirsute margin, arising singly or in groups of 2 to 3 (rarely up to 8) in the late winter or early spring from a sclerotium lying on or immediately below the soil; a clay- to cinnamon-coloured, glabrous, pruinose, erect, slightly curved, or sinuous, filiform stipe, 2 to 3 or up to 15 to 18 by 1 to 1·5 mm., occasionally furnished with one or more rhizoids; a russet- to walnut-brown, somewhat pruinose hymenial surface; cylindrical asci, 140 to 260 by 9 to 14 (average 180 by

12) μ, containing eight uniseriate, ellipsoid, non-septate, hyaline, usually uni- to triguttulate ascospores, 10 to 18 by 8·5 to 10 (16·3 by 9·3) μ; terete, septate paraphyses, mostly simple; obovoid, hyaline conidia, 40 to 60 by 21 to 36 (50 by 28) μ, including the basal appendage, or (under humid conditions) clavate to piriform, up to 72 μ in length, produced singly on short, simple branches protruding from the host surface and separating from the conidiophores by means of a disjunctor cell remaining attached to the conidium (at this stage a thin weft is formed over the surface of the host organ, whence the conidia are promptly disseminated by insects or meteoric water, or they may germinate *in situ*); globose spermatia, 3 to 3·5 μ in diameter, produced at the tips of fusoid, caespitose hyphae, 10 to 12 by 3 μ, appearing (usually singly but sometimes in short chains) simultaneously with the circular to elliptical or irregular, cupulate, black sclerotia, smooth on the concave surface, verrucose to rugose on the convex, 2 to 5 by 3 to 10 by 0·5 to 1·5 mm., formed within the invaded host tissues but separable therefrom at maturity.

O. azaleae makes good growth at 18° to 22° C. on 2 per cent. potato dextrose agar at P_H 6, forming a coarse, tough, matted, greyish-white to pale fawn mycelium, becoming stromatoid and darkening later; sclerotia and spermatia, but no conidia, are also produced on bean-pods and barley or wheat kernels.

Ovulinia is obviously related to *Sclerotinia* in its sclerotial and apothecial characters, as well as in its pathogenesis, but the erection of a new genus was necessitated by the entirely atypical mode of conidial production in the *Rhododendron* fungus.

AKAI (S.). **On the pathological histology of hypertrophied leaves of Camellia sasanqua caused by Exobasidium camelliae var. gracilis.**—*Ann. phytopath. Soc. Japan*, ix, 2, pp. 61–68, 1 pl., 2 figs., 1939. [Japanese, with English summary.]

A description is given of the histological changes occurring in the hypertrophied foliage of *Camellia sasanqua* attacked by *Exobasidium camelliae* [*R.A.M.*, xviii, p. 528] var. *gracilis*.

GHILLINI (C. A.). **Cancro delle Gardenie.** [*Gardenia* canker.]—*Riv. R. Soc. Tosc. Ortic.*, xxiv, 7–8, pp. 145–149, 1939. [Abs. in *Biol. Abstr.*, xiv, 3, p. 524, 1940.]

An illustrated account is given of a stem canker of *Gardenia* observed at Bologna and ascertained to be due to *Phomopsis gardeniae* [*R.A.M.*, xix, p. 350]. Inoculation experiments with pycnospore suspensions of the fungus gave positive results.

MCKENZIE (M. A.), JONES (L. H.), & GILGUT (C. J.). **Phomopsis gardeniae in relation to Gardenia culture.**—*Plant Dis. Reptr*, xxiv, 3, pp. 58–62, 1940. [Mimeographed.]

Details are given of observations and inoculation tests at the Massachusetts Agricultural Experiment Station, the outcome of which indicated that the agent of *Gardenia* canker, *Phomopsis gardeniae* [see preceding abstract], enters exclusively through the leaf, stem, and root wounds, and remains localized in the region of malformation or distor-

tion, cuttings from diseased plants being largely free from infection. Of primary importance in the control of the canker is extreme care in the handling of cuttings, the use of a sharp knife being essential to avoid tearing the tissues. With proper precautions it should not be necessary to sacrifice infected blossoming plants immediately, if the value of the flowers warrants delaying their destruction until the end of the flowering period.

POLLACCI (G.) & BERGAMASCHI (M.). **Azione delle vitamine sulla germinazione dei semi di Orchidee.** [The action of vitamins on the germination of Orchid seeds.]—*Boll. Soc. ital. Biol. sper.*, xv, 2, pp. 326–327, 1940.

Following up the studies of the first-named author, Burgeff, and Cappelletti on the influence of the metabolic products of the appropriate symbionts [(?) including *Corticium catonii*] on the germination of orchid seeds [*R.A.M.*, xix, p. 111], the writers grew seeds of *Oncidium pulvinatum* on the medium of Knudson-Burgeff, with and without the addition of (*a*) 0·2 per cent. vitamin C (ascorbic acid) and (*b*) filtrates of symbionts (specific or otherwise) or the living fungus. The development of these cultures was entirely satisfactory, in contrast to that of the seeds on the nutrient medium without accessory substances, which ceased growth at the protocorm stage. The addition of traces of vitamin C (crystallized) induced a resumption of the normal functions. Seeds of *Cattleya labiata autumnalis*, though capable of germination on the nutrient medium, also benefited in the later stages of growth by treatment with vitamin C or the fungal filtrates. Further experiments are in progress to determine the exact nature of the connexion between vitamin C and the metabolic products of the fungi concerned.

FISCHER (G. W.). **Grass diseases occurring in the Pullman Nursery Unit of the Soil Conservation Nurseries, Pullman, Washington, during 1939.**—*Plant Dis. Reptr*, xxiv, 5, pp. 108–114, 1940. [Mimeographed.]

Alphabetical host and pathogen lists are given of the fungal diseases affecting grasses in the Pullman (Washington) Nursery Unit of the Soil Conservation Nurseries during 1939.

SPRAGUE (R.). **A third species of Mastigosporium on Gramineae.**—*Mycologia*, xxxii, 1, pp. 43–45, 1 fig., 1940.

In accordance with Articles 16 and 60 of the present International Rules of Botanical Nomenclature, which stipulate that varietal names raised to specific rank are invalid when a specific epithet is available, the author proposes a new combination, *Mastigosporium rubricosum* (Dearn. & Barth.) Sprague for *Fusoma rubricosa*, the name *M. calvum* [*R.A.M.*, xviii, p. 34] previously proposed for this fungus being relegated to synonymy.

A new species, named *M. cylindricum*, was found on living leaves of *Bromus vulgaris* in Douglas County, Oregon, where it is probably native. It is described [with a Latin diagnosis] as causing brown, elliptical to elongate, finally confluent and mottled spots mostly along the sides and tips of the leaves. The mycelium is mostly endophytic,

somewhat coalesced beneath the upper leaf surface, coarse, and hyaline or lightly tinted. The short and stout conidiophores produce spores by expansion of the distal portion and eventual abscission. The spores are straight-sided, slightly or scarcely constricted at the septa, cylindrical with rounded, blunt ends, typically capsular, hyaline, triseptate, and measure 25 to 32 by 4·5 to 5·9 μ.

MEIER (A. A.) & KRIVODUBSKAYA (Mme N. I.). Меры борьбы с цветочной плесенью Красного Клевера. [Methods for controlling the anther mould of Red Clover].—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 125–129, 1939. [Received April, 1940.]

The primary infection of red clover with anther mould (*Botrytis anthophila*) [*R.A.M.*, xviii, p. 115] is stated to occur through the seed, the fungus becoming systemic throughout all aerial parts of the plants. The mycelium enters the parenchymatous cells under the seed coat and near the radicle between the cotyledons, and fungicidal solutions must be able to penetrate the seed coat in order to kill the mycelium inside the seed. Of the seed treatments tested in the present study, the best results were obtained with meranin [loc. cit.] and the preparation NIUIF-1 (containing 1 per cent. organic mercury), each used at a strength of 1 in 1,000 (NIUIF-1 also at 1 in 400) for an immersion period of one hour. The former reduced infection in 20-day-old plants from 26·8 per cent. in the untreated control to 1·6, and the latter reduced infection in 9-day-old plants from 24 per cent. in the control to 11 using the 1 in 1,000 solution, complete elimination being obtained with the 1 in 400. The meranin treatment also killed all other moulds observed by the authors on red clover seeds, including *Fusarium poae*, *F. herbarum* [*F. avenaceum*], and *Nigrospora oryzae*. Neither treatment had any adverse effect on germination. Negative results were obtained with the usual wet and semi-dry treatments with formalin.

JONES (F. R.) & WEIMER (J. L.). **Three anthracnoses of Alfalfa.**—*Plant Dis. Reptr*, xxiv, 2, pp. 30–31, 1940. [Mimeographed.]

Two species of *Colletotrichum* were found on lucerne showing extensively blackened stems and partial defoliation in a nursery in Georgia. One, with straight spores mostly 14 to 18 μ long, was tentatively identified as *C. destructivum* [*R.A.M.*, xiv, p. 85], while the other, with straight spores about 25 μ long, appeared to be identical with *C. graminicola* [loc. cit.]. *C. trifolii* [ibid., xiii, p. 168] commonly occurs on lucerne in Georgia.

VERESCIAGHIN (B.). **Bolile cryptogamice pe ramurile şi tulpinile pomilor roditori.** [Fungous diseases of stems and branches of fruit trees.]—*Bul. agric. Basarabia, 1940*, 1, pp. 11–12, 1940.

This is a preliminary account of the author's observations during many years in Bessarabia and Bukovina on diseases of fruit trees. The diseases mentioned include the following: *Sphaeropsis malorum* [*Physalospora obtusa*: *R.A.M.*, xv, p. 202] is widespread, mostly on apples; *Erwinia amylovora* is reported to occur on both apples and pears, mostly in Bukovina [ibid., xvii, p. 656]; *Clasterosporium carpophilum* attacks apricot trees seriously; *Sclerotinia fructigena* occurs on apples,

S. cinerea [*S. laxa*] on plums, and *S. laxa* on apricots; *Melanconium juglandinum* and *Pseudomonas juglandis* are found on young and old walnut trees, respectively; and finally *Bacterium tumefaciens* is stated to be prevalent.

SHERBAKOFF (C. D.) & ANDES (J. O.). **Apple and Pear fire blight.**—*Circ. Tenn. agric. Exp. Sta.* 64, 4 pp., 1939. [Abs. in *Chem. Abstr.*, xxxiv, 8, p. 2522, 1940.]

Blossom blight of apples and pears [*Erwinia amylovora*] may be sufficiently reduced to assure a full crop by two applications of 1–3–50 Bordeaux mixture, one in the middle and another in the late stages of flowering. Further, infected areas should be excised and painted with a mixture of 2 oz. glycerol, 4 oz. wintergreen oil [methyl salicylate], 2 oz. ethyl alcohol, and 1 qt. methyl alcohol, to which is added 4 oz. cobalt nitrate crystals, or a zinc chloride solution may be used.

CHITTENDEN (E.). **Use of borax sprays in the control of internal cork of Apples.**—*N.Z. J. Sci. Tech.*, A, xxi, 5, pp. 303–304, 1940.

Satisfactory control of internal cork in Cox's Orange, Delicious, Sturmer, Jonathan, and other apple varieties were obtained in the Nelson district of New Zealand by spraying with hydrated borax [*R.A.M.*, xix, p. 29] or rasorite (a natural borax containing 44.5 per cent. boric oxide equivalent) at a concentration of 0·10 per cent., the incidence of the trouble being reduced in one orchard from 53 per cent. to nil at this minimum strength, no increase in which appears to be called for. No difficulty was experienced in the combination of either material with other sprays, including lead arsenate, lime-sulphur, ialine, colloidal sulphur, and spreaders (kayso, kaysene, and lethalate), and the introduction of hydrated borax into the commercial spray programme for November is recommended as an alternative to soil top-dressings of borax or rasorite. There were no deleterious effects on the leaves or fruits as a result of the treatments.

THOMAS (H. EARL) & RAWLINS (T. E.). **Some mosaic diseases of Prunus species.**—*Hilgardia*, xii, 10, pp. 623–644, 9 figs., 1939.

The following diseases of the mosaic type are described [and the symptoms illustrated] on species of *Prunus* in central California [cf. *R.A.M.*, xviii, p. 260]. Two types of mosaic, both transmissible by grafting, were observed on sweet cherry: one, which is characterized by chlorotic blotches, lines, or rings, is more apparent on rootstocks than top plants, and comparatively mild on the more common orchard varieties; the other, designated 'cherry mosaic 1', is widely distributed in the State, and transmissible to peach and apparently to other species. The latter is characterized by large chlorotic blotches on the young leaves followed by distortion, the chlorotic areas often dropping out and many leaves falling by midsummer. Later in the season, a milder mottling of the leaves with little or no distortion is often observed and compact tufts of small and sometimes distorted leaves from latent buds on large branches of older trees rather constantly appear, the fruit being scanty and in some varieties somewhat misshapen.

On almond a common symptom of mosaic is a small, pale-green to

white, more or less star-shaped spot on the leaf blade, or at other times large chlorotic blotches or bands, usually with little or no distortion. This latter symptom picture, designated by G. L. Stout as 'calico', was transmitted to peach and cherry, with rather strong symptoms on the latter.

At least two types of mosaic were observed on Japanese plum (*P. salicina*). One, referred to as the Vacaville plum mosaic, has so far been found only in one locality on the variety Santa Rosa, and is similar to a mosaic reported from Kentucky [ibid., xii, p. 454]. Its symptoms are mild, consisting in pale green blotches, lines, and rings in the leaf blade; transmitted by buds to peach seedlings a mild mottling was produced. During five years' observation the disease did not appreciably reduce the vigour of the trees. The other type of mosaic on plum was found on several varieties, the typical symptoms on Santa Rosa being rather small, completely chlorotic spots, more numerous towards the distal end of the leaf blade.

A mosaic of Standard prune produces few or many small chlorotic spots, often more numerous towards the tip of the leaf, coalescing to cause distortion and dropping-out of parts of the leaf blade. The disease is more apparent in mid-season than in early spring and in the greenhouse than out of doors. It was successfully transmitted to peach. A mosaic found on Sugar prune, though similar to that of Standard, is not identical with it and both diseases are distinct in appearance from that of Italian prune in western New York [ibid., xvi, p. 330].

Apart from the destructive mosaic disease of peaches occurring in Texas and elsewhere [ibid., xvi, p. 543], one distinct disease, the 'asteroid spot', was found in southern California [ibid., xvii, p. 609], and another, found only at Winters, California, is designated Winters peach mosaic. The symptoms of the latter are most noticeable at the beginning of the growing season: pale green to pale yellow, oblong, feather-edged blotches appear along the midvein and larger lateral veins of young leaves, followed by distortion of the lamina and dropping out of chlorotic parts. Later in the season mild symptoms appear, definite chlorotic lines and rings being rare. On severely affected branches, the leaf buds often push out pale leaf tips, which do not develop further for several weeks. Eventually these branches die back or produce compact clusters of small, narrow leaves, often somewhat curved laterally and not conspicuously mottled. The flowers show no symptoms, while fruit yields vary proportionally to the stage of development of the disease. Winters peach mosaic occurs naturally on peach, apricot, and probably almond; it was transmitted by grafting to *P. andersonii*, apricot, cherry, almond, *P. mume*, *Kerria japonica*, and Ragged Robin rose. Symptoms on several species and the results of cross-inoculations indicate that almond calico, cherry mosaic 1, and Winters peach mosaic may be related, but certain other symptoms and the failure to immunize peach seedlings against Winters peach mosaic by the use of milder mosaic viruses seem to show that they are not identical.

CHESTER (K. S.). **Virus diseases of the stone fruits.**—*Plant Dis. Reptr*, xxiv, 4, pp. 74–78, 1940. [Mimeographed.]

A table is given showing the symptoms on fruits and leaves of 13

recognized virus diseases of stone fruits (including eight of peach, three of cherry, and two of plum), the growth habit of affected trees, the range of infection in the United States, and the States in which quarantines are imposed. Brief explanatory comments are added. A list is appended of a further eight diseases, believed to be of virus origin, reported from the United States but excluded from the table on account of insufficient information as to their etiology. [In *Plant Dis. Reptr*, xxiv, 6, p. 132, 1940, the author publishes certain emendations by W. D. Valleau and L. Hutchins to his descriptions of plum mosaic and phony peach, respectively.]

THOMAS (H. EARL), GILMER (R. A.), & SCOTT (C. E.). **Rust of stone fruits.**—*Mon. Bull. Calif. Dep. Agric.*, xxviii, 5, pp. 322–327, 1939.

Examination of numerous collections of *Tranzschelia* [*Puccinia*] *pruni-spinosae* [*R.A.M.*, xviii, p. 745] on various stone fruits from different parts of California showed all to belong to the *discolor* type [ibid., xvii, p. 756]. Inoculations on contrasted half-leaves of peach and prune with uredospores from these hosts showed that at least two distinct physiologic forms of the fungus are present in central California. When whole, detached leaves were used for the inoculations, uredospores from prune gave marked infection on prune, moderate on plum, slight on apricot, and no infection on almond, cherry, and peach. Aecidiospores from cultivated *Anemone* growing next to a prune orchard gave similar results. Spores from peach gave strong infection on peach, slight on apricot and plum, and none on prune, almond, and cherry. The evidence suggests that yet other physiologic forms may be present where almond and apricot are severely affected.

The fungus appears to overwinter in three ways in California, in twig cankers on peach trees, in the form of uredospores on the bark or buds, and on living, infected leaves, which remain attached to the tree. Infection of cultivated *Anemone* is uncommon locally, and does not appear to be an important source of attack on fruit trees.

LOUW (A. J.). **Gum-spot disease of stone fruits.**—*Fmg S. Afr.*, xv, 168, pp. 105–108, 128, 6 figs., 2 graphs, 1940.

During the past two years gum spot of stone fruits (*Clasterosporium carpophilum*), which previously appears to have caused little serious damage in South Africa, has assumed epidemic proportions on apricots in the French Hoek area and on apricots and peaches in the Paarl district.

Leaf infection was observed to take place directly through the epidermis and equally readily on the upper and lower surfaces. Relatively long periods of continuous wetting are necessary for infection to occur [cf. *R.A.M.*, xvii, p. 257], and the less favourable the temperature the longer the wetting period required. Dissemination was found to depend exclusively on moisture, and to be effected, apparently, by means of the downward washing of spores over the twig surface during rain, lateral distribution occurring only when rain is accompanied by a strong wind.

All the chief varieties of stone fruits tested were found to be susceptible. Elberta peaches and Japanese plums [*Prunus salicina*] yielded no positive shoot infections, but the fruits and leaves were readily

infected. Apparently, the degree to which various stone fruits are subject to the disease largely depends on their respective growing periods in relation to climatic conditions. Almonds, Alpha apricots, and the early peach varieties, King Edward VII and Early Dawn, are highly susceptible, though later varieties growing between affected early ones generally remain healthy.

Spraying experiments [details of which are given] showed that one winter application of home-made Bordeaux mixture (4–6–50 plus $\frac{1}{4}$ lb. ortho-spreader) or verderame (5 lb., with $\frac{1}{4}$ lb. ortho-spreader per 50 gals. water) gave adequate control on peaches, if made before the arrival of the winter rains. Infected wood should be removed during winter pruning and burnt.

SMITH (W. H.). **Further observations on physiological breakdown in stored Plums.**—*J. Pomol.*, xviii, 1, pp. 74–87, 4 graphs, 1940.

In storage experiments with Victoria plums at the Ditton Laboratory, East Malling, Kent, similar results were obtained to those previously reported for Monarch plums [*R.A.M.*, xix, p. 105], giving support to the view that jellying and internal browning are distinct types of injury arising from different causes. When stored for periods from three to five weeks at a range of temperatures from 65° to 31° F., Victoria plums showed a minimum amount of total breakdown at about 34°; at higher temperatures it increased owing to a rise in the amount of jellying, and also at lower temperatures owing to a rise in the amount of internal browning, jellying falling practically to nil at 31°. The advance of jellying was accelerated, while internal browning was reduced, by greater maturity at picking time. Internal browning was checked, and jellying only slightly increased, by interrupting a 35 days' storage at 31° at the 17th day for an intermediate exposure to a temperature of 65° for four days. Pre-storage treatment of Monarch plums with ethylene (1/680 for two days at room temperature) reduced the amount of internal browning after 22 days' storage at 31°, 34°, and 40°, to nil, but induced severe jellying at 31° and 34°, where it did not otherwise occur, and increased the amount of it at 40° to 100 per cent. A gas mixture containing 2·5 per cent. carbon dioxide, 2·5 per cent. oxygen, and 95 per cent. nitrogen suppressed jellying in Victoria plums stored at 37°, but induced internal browning, which does not otherwise occur at that temperature. It is suggested that jellying is brought about by a modification of the senescent metabolism usually occurring at ordinary temperatures and induced by exposure to cold over a certain range of temperatures. It does not seem to cause actual death of tissue except in the most advanced stages. Internal browning, on the other hand, is the first visible manifestation of a specific type of injury that has already killed the tissue.

GIGANTE (R.). **Cancri prodotti dal freddo sopra rametti di Susino.** [Cankers produced by the cold on Plum branches.]—*Boll. Staz. Pat. veg., Roma*, N.S., xix, 4, pp. 453–472, 1 pl., 15 figs., 1939. (Issued March, 1940.)

A detailed description is given of cankers produced by the action of cold weather on branches of the Shiro plum variety in Italy. The simplest type consisted of a longitudinal cracking, but in more complex

forms, true cankers were produced, in which the cortical tissues were irregularly arranged, contained numerous cavities, and showed woody areas surrounded by a cork ring.

BRIEN (R. M.). **Brown-spot (Alternaria passiflorae Simmonds). A disease of the Passion-Vine in New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxi, 5, pp. 275–279, 4 figs., 1940.

Brown spot of the passion vine (*Passiflora edulis*) due to *Alternaria passiflorae* [*R.A.M.*, xix, p. 294] has been present in New Zealand for several years and in severe cases causes defoliation, shrivelling of the fruits, reduction in bearing capacity, and diminution of yield. Inoculation experiments with pure cultures of the organism from potato dextrose agar resulted in the development of typical symptoms on the foliage, stems, and fruits. Control measures should include the excision and destruction of diseased material, pruning and training the vines to allow of spray penetration, and two to three applications of 3–4–50 Bordeaux mixture from the commencement of new growth in early October onwards.

MARTIN (H.). **The incorporation of direct with protective insecticides and fungicides. IV. The evaluation of the wetting and spreading properties of spray fluids.**—*J. Pomol.*, xviii, 1, pp. 34–51, 1940.

Twenty different water-soluble products of potential value as spray spreaders, including some alkyl sulphates and several proprietary products, such as sulphonated lorol, lethalate, igopon T and A, sapamine MS, and others, all containing active constituents of long chain structure, were examined in further laboratory studies [*R.A.M.*, xvii, p. 542]. It was found that a similar linear relationship exists between the advancing and receding contact angles made by solutions of many surface-active substances; the occurrence of important exceptions to this rule, however, justifies the view that these two values are distinct entities. The area of spread of droplets on a given surface is related to functions both of the contact angle and of the spreading coefficient on that surface, and is equally well determined by either the advancing or equilibrium contact angles. The determination of area of spread is, however, considered to be of doubtful value in assessing properties because of the experimental difficulties involved in dealing with small droplets and the uncertainty of the contact angles assumed by larger droplets. The maximum initial retention is determined by contact angle and spreading coefficient, and similar correlations are obtained when either the receding contact or the equilibrium contact angles are used in the estimation of the correlation coefficients. These relationships appear also to exist in spreaders of other than the long chain classes. This method of determination has also been applied to heterogeneous spray systems and a satisfactory agreement has been found with the figures obtained in field trials of the same sprays. It is therefore suggested that the laboratory determination of the amount of spray retained under standard conditions upon a given vertical surface provides a reliable method for the evaluation of spray spreaders and is suitable for the routine standardization of the wetting and spreading properties of compounded spray materials.

Everitt (E. L.) & Sullivan (M. X.). **The fungistatic and fungicidal action of certain organic compounds.**—*J. Wash. Acad. Sci.*, xxx, 3, pp. 125–131, 1940.

Some 50 organic sulphur compounds were tested for their fungistatic and fungicidal action against Sabouraud's dextrose agar cultures of *Fusarium oxysporum* and *F.* [*bulbigenum* var.] *lycopersici*, the agents of potato and tomato wilt, respectively, *Aspergillus fumigatus*, a pathogen of man, *A. niger*, responsible for foodstuff spoilage and occasionally infecting human beings, and Fleming's bacterial-inhibitory *Penicillium* [*R.A.M.*, xiv, p. 464]. Phenyl thioarsenite, 4-chloro-2-nitrophenyl sulphur amine, 1, 2 naphthoquinone-4-sodium sulphate, and protylin or sulphanilamide were fungistatic at the rates of 12·5, 12·5, 12·5, and 25 mg. per 100 c.c., respectively, and mercaptobenzothiazole and phenylbenzothiazole were fungicidal, both at 10 mg. Mercaptobenzothiazole is the most effective of all the preparations used in the experiments, inhibiting the growth of all the test organisms at a strength of 50 to 100 parts per million; it is inexpensive and plentiful supplies are available. The therapeutic value of the various compounds requires further testing on laboratory animals before definite recommendations can be made, but preliminary oral and intraperitoneal experiments on guinea-pigs with mercaptobenzothiazole gave little or no evidence of toxicity.

Steinmetz (F. H.) & Gashwiler (J. S.). **Some recent observations and reports on Eelgrass in Maine.**—*Plant Dis. Reptr*, xxiv, 5, pp. 116–118, 1 map, 1940. [Mimeographed.]

Observations and records from 1937 to 1939 on the status of the eelgrass (*Zostera marina* var. *stenophylla*) beds in Maine are stated to point to the rehabilitation of the plants, which are producing seeds at several points along the coast and should shortly, in the absence of a recrudescence of wasting disease [*Labyrinthula* (?) *macrocystis*: *R.A.M.*, xvi, p. 697; xix, p. 35], completely regain their former condition.

Wilkins (W. H.) & Patrick (Sheila H. M.). **The ecology of the larger fungi. IV. The seasonal frequency of grassland fungi with special reference to the influence of environmental factors.**—*Ann. appl. Biol.*, xxvii, 1, pp. 17–34, 5 graphs, 1940.

Further observations during 1937 on grassland fungi in three stations (clay, chalk, sand) near Oxford [*R.A.M.*, xviii, p. 405] showed that their seasonal variation is conditioned by environmental factors, chiefly temperature and soil-water content. The number of fungus sporophores produced was found to be in direct relationship to these two factors, and it is suggested that the well-known summer and autumn fungus seasons are due to the fact that only at these two periods of the year does a synchronization of favourable factors occur. Lists are given of the seasonal distribution of the fungi in the three stations and of the species showing seasonal frequency of individuals.

Lochhead (A. G.). **Qualitative studies of soil micro-organisms. III. Influence of plant growth on the character of the bacterial flora.**—*Canad. J. Res.*, Sect. C., xviii, 2, pp. 42–53, 1940.

The results of this laboratory study show that the rhizospheres of red

clover [*Trifolium pratense*], mangels, oats, tobacco, maize, and flax are richer in Gram-negative short rods and poorer in Gram-positive short rods, coccoid rods, and spore-forming bacteria than control soils at a distance from the plants. Comparing the bacterial floras of the rhizospheres of the Bison and Novelty flax varieties, resistant and susceptible to wilt (*Fusarium lini*), respectively, and of the tobacco strains RH. 211 and CH. 38, resistant and susceptible to black root rot (*Thielaviopsis basicola*), respectively, it appeared that Gram-negative short rods were relatively more abundant, and coccoid rods and spore-forming bacteria less numerous in the rhizosphere of the susceptible than in that of the resistant plants. These results suggest the possibility that resistance to soil-borne diseases may be linked up with a selective action of root excretions upon the saprophytic microflora, favouring types antagonistic towards pathogenic organisms [cf. *R.A.M.*, xviii, p. 50].

Lochhead (A. G.), Timonin (M. I.), & West (P. M.). **The microflora of the rhizosphere in relation to resistance of plants to soil-borne pathogens.**—*Sci. Agric.*, xx, 7, pp. 414–418, 3 figs., 1940.

Plate counts of micro-organisms from the rhizospheres of varieties of flax and tobacco, resistant or susceptible to wilt [*Fusarium lini*] and black root rot [*Thielaviopsis basicola*], respectively, showed that rhizospheres of susceptible varieties harboured larger numbers of bacteria and fungi than those of resistant. Thus, the number of fungi found in 1 gm. rhizosphere soil of the resistant flax variety Bison and tobacco RH. 211 field plants was 48,500 and 239,000, respectively, as compared with 75,600 and 939,700, respectively, for the susceptible Novelty flax and CH. 38 tobacco. The ratios of the rhizosphere population to that of the control soil were definitely higher under dry (30 per cent. saturation) than under moist (60 per cent.) soil conditions. In the case of Actinomycetes the differences between rhizosphere and control soil and between varieties were less apparent. The results of qualitative studies of bacterial groups in plant rhizospheres have already been noticed from another source [see preceding abstract]. Organisms isolated from the rhizosphere of the resistant flax variety on various media showed an increase of 83 per cent. over the control in bacterial types for which amino-nitrogen is either stimulative or essential and one of 71 per cent. in those influenced by a combination of growth factors including thiamin and biotin, while isolations from the susceptible variety showed corresponding increases of 325 and 143 per cent. Similar tendencies were noted in the case of tobacco varieties.

Björkman (E.). **Om mykorrhizans utbildning hos Tall- och Granplantor, odlade i näringsrika jordar vid olika kvävetillförsel och ljustillgang.** [On the development of mycorrhiza in Pine and Spruce seedlings grown in rich soils with a varying supply of nitrogen and access of light.]—*Medd. Skogsförsöksanst., Stockh.*, 32 (2), pp. 23–74, 23 figs., 7 graphs, 1940. [English summary.]

A detailed, tabulated account is given of an experimental study, forming part of an investigation planned by H. Hesselman (*Bot. Notiser, 1939*) and to be further pursued by him, on root and mycorrhiza development in one- and two-year-old pine (*Pinus sylvestris*) and spruce

(*Picea excelsa*) [*P. abies*] seedlings, grown in eight different soils, mostly mulls rich in nutrients, under varying intensity of light and receiving different amounts of nitrogen up to 81 gm. ammonium nitrate per 7 l. pot.

In all forms of humus the roots were shorter and less branched in the series supplied with large amounts of nitrate, very high doses of which further induced coarsening and the formation of swollen, claviform tips. In heavily shaded pots the roots were poorly developed and sparsely ramified. Root hairs were more numerous (especially in spruce) in cultures with added nitrate and heavily shaded than in those otherwise treated. The short roots (0·5 to 5 mm. in length) were usually single or little branched, most of them (60 to 90 per cent.) assuming form A (ordinary, often furcate, as in pine, or bushy, as in spruce, without hyphal strands) and B (like the foregoing, but with a pseudomycorrhizal structure in the main basal part). Type C of Melin, formed by *Boletus* spp. [*R.A.M.*, iii, pp. 358, 541], was found in the present series of tests only in occasional pine plants in 'mor' and sand (humus mixed with sand in a volume ratio of 1 : 2). Type Da, characterized by thin, blackish-brown hyphae, forming a secondary mantle outside an original mycorrhiza (*M*[*ycelium r*[*adicis*] *atrovirens*) [ibid., xviii, p. 700], and Dn, with coarser hyphae profusely radiating from the surface (*M. r. nigrostrigosum*) [ibid., xviii, p. 701] were only sparingly represented in the available material. Various other types of mycorrhiza were found in the other soils tested (mull-oak wood, mull-spruce wood, mull-alder wood, high calcium mull-spruce wood, 'mor and sand') and are described.

The morphological and anatomical structure of the mycorrhiza was not as a rule appreciably modified by the addition even of large quantities of nitrate, or by restricted illumination. In 'mor', however, intracellular infection was reduced in the series given 9 gm. nitrate per pot, while in mull-alder wood the plants supplied with 27 gm. produced a peculiar type of mycorrhiza with a soft, pale yellow mantle round the swollen lateral and short roots. Mycorrhizal development was equally good at 23, 49, and 76 per cent. incident radiation, measured by Aurén's thermoelectric solarimeter (*Medd. methydr. Anst. Uppsala*, 16, 1937), both in spruce and pine. On the other hand, no mycorrhiza were formed by one-year-old seedlings at 6 to 8 per cent., and in the case of pine development was very poor at 12 per cent. Spruce seedlings grown in the shade of *Aegopodium podagraria* and *Scrophularia nodosa* showed an average of only two mycorrhiza per plant, as compared with 47 in the controls. In most soils the mycorrhizal percentage reached the maximum value of 60 to 90 per cent. at 23 per cent. radiation. Pseudomycorrhiza occurred in large numbers in spruce and pine seedlings grown in light weaker than 23 per cent., but their parasitic mycelium did not appear to be very active, nor was the *M. r. atrovirens*, with its parasitic secondary mantle, consistently more prevalent in the heavily shaded cultures. In the combined series of tests (nitrogen and light factors both varied), the mycorrhizal percentages rose more slowly in the high-nitrate pots with increasing radiation than in those given less of the nutrient. There was, however, no general injury or retardation in growth at a given radiation from nitrate applications at the rates of 3 and 9 gm. per pot.

Steinberg (R. A.) & Thom (C.). **Chemical induction of genetic changes in Aspergilli.**—*J. Hered.*, xxxi, 2, pp. 61–63, 1940.

In further studies on the development of genetic changes in *Aspergillus* through the influence of nitrite [*R.A.M.*, xix, p. 37], *A. nidulans*, *A. fumigatus*, *A. alliaceus*, *A. fischeri*, *A. variecolor*, and *A. flavus*, in addition to *A. niger* and *A. amstelodami*, were grown in a mannitol-sodium nitrite solution. In this medium *A. fumigatus* gave rise to three types of sterile mutants, one with long aerial hyphae completely filling the tube, another with short aerial hyphae, and a third virtually devoid of aerial hyphae, tumulose, of a rather darker colour than the others, and tending to change into the second type. A form resembling the last-named was also produced by *A. niger*. An asexual mutant derived from *A. fischeri* would undoubtedly have been referred, on the basis of its profusion of conidia, to *A. fumigatus* had its origin not been known. A mutant of *A. variecolor*, unlike the parent strain used in the experiments, formed a continuous growth over the surface of Czapek's agar slants. Neither in this species nor in *A. amstelodami* was it possible entirely to suppress perithecial formation by chemical means, though in some of the others the production of both perithecia and sclerotia was definitely inhibited. The similarity in the response of these two structures to nitrite treatment is considered to point to a far-reaching morphological and physiological agreement between them. Conidial production, as already indicated, was not influenced in a uniform manner by the treatment. It is estimated that at least 50 per cent. of the trials undertaken with nitrite treatment should yield mutants under appropriate conditions.

The nature of the carbon source would appear to influence, though not to determine, the development of mutants in nitrite solutions, only 40 per cent., for instance, being formed in one test with sucrose, as compared with 80 per cent. with mannitol.

Mutants of *A. niger* were also produced in solutions of mannitol or sucrose with potassium iodide and ammonium nitrate or ammonium chloride; with ninhydrin and ammonium chloride or sodium nitrate; with chloramine-T and ammonium chloride, ammonium nitrate, or sodium nitrate; and with formin or potassium bichromate. Though none of these compounds was as effective for the end in view as sodium nitrite, the basis of their action is obviously identical and consists in the elimination of amino nitrogen from protein.

Hellinga (J. J. A.). **On the effect of substances, produced by fungi, on the respiration of the tissue of Potato tubers. I and II.**—*Verh. Akad. Wet., Amst.*, xiii, 2, 30 pp., 8 graphs, 1940.

In connexion with studies at Hilversum, Holland, in 1939, on the increased intensity of respiration in plants attacked by an infectious disease, the effect of acid oatmeal agar culture extracts of *Gibberella saubinetti*, *Fusarium coeruleum*, *F. bulbigenum* var. *lycopersici*, and *F. trichothecioides* on the respiratory process in thin disks of Z. Eigenheimer, Bintje, and Muizen potato tubers was investigated by means of Warburg manometers.

Even at very low concentrations (1 in 10^5) the fungal extracts in-

duced a rapid and usually constant increase of the respiration rate, which was practically doubled in all cases immediately after the introduction of the extract into the vessels and remained at the same high level for the next two hours. The active substances proved to be thermostable, non-volatile, and insoluble in ether and chloroform, but subject to adsorption by activated coal (Norite) and Seitz EK asbestos filter plates; they may be restored to potency by rinsing out the adsorbent. The fungal extracts do not alter the respiratory quotient of the potato tissue. Evidence was obtained that the extracts act on the polyphenol-oxidase system but exert no influence on the residual respiration (amounting to 35 to 40 per cent.) unaffected by the addition of potassium cyanide solution (0·0005 M.). It is concluded from the results to date (the experiments are not yet completed) that the increase of oxygen consumption in potato tuber tissues under the influence of the specific fungal toxins is not caused by the oxidation of some added oxidizable substance.

SMITH (K. M.) & DENNIS (R. W. G.). **Some notes on a suspected variant of Solanum virus 2 (Potato virus Y).**—*Ann. appl. Biol.*, xxvii, 1, pp. 65–70, 1 pl., 1940.

A virus resembling potato virus Y but different from it in certain respects was found in 1935 affecting a White Burley tobacco plant. The disease was severely necrotic and superficially resembled that caused by the combined potato viruses X and Y on tobacco. Inoculations of White Burley tobacco and a number of other Solanaceous plants produced the characteristic necrosis only in some tobacco plants, while the rest developed a veinbanding typical of virus Y. Return inoculation to tobacco readily yielded the necrotic disease, except in the case of *Lycopersicum racemigerum* [*L. pimpinellifolium*] and *Salpiglossis variabilis*, from which only the veinbanding constituent could be reisolated. Neither phase could be recovered from *Schizanthus retusus*, *Solanum nodiflorum* (both susceptible to virus Y), or *Datura stramonium* [*R.A.M.*, xvi, p. 703]. The disease was transmitted to various potato varieties both by grafting and through sap, but only from President and International Kidney was it possible to reisolate the full necrotic disease; from all others the veinbanding phase only was recovered.

The virus causing the full necrotic phase was detected in sap heated to 50° C. for 10 minutes, but in a second experiment only the veinbanding phase survived at that temperature. In sharp contrast to virus Y, the veinbanding phase of the disease retained its infectivity at room temperature for 27 days or longer; the necrotic phase was lost after 24 hours' ageing. In filtration experiments the necrotic phase passed both the kieselguhr and the first membrane of A.P.D. 0·584 μ; only the veinbanding phase was capable of passing the membranes of 0·459, 0·302, and 0·215 μ. The necrotic phase was generally lost at dilutions of 1 in 800, although it appeared irregularly even below these; the veinbanding phase persisted in dilutions of 1 in 1,000 but not beyond. Only the veinbanding phase was transmissible by *Myzus persicae* and *Macrosiphum gei* [*M. solanifolii*]. Some evidence was obtained indicating that no cross-immunity exists between the virus in question and viruses A, X, and Y. It is concluded from these data that the virus is

presumably a variant of potato virus Y; it is suspected that the necrotic phase is due to a separate virus of very unstable character.

NAOUMOVA (Mme N. A.). Инфекция Картофеля **Phytophthora infestans D.B.** от больных клубней. [The infection of Potatoes by *Phytophthora infestans* de Bary from diseased tubers].—*Bull. Pl. Prot., Leningr., 1939*, 1, pp. 94–102, 1939. [Received April, 1940.]

When tubers of the potato varieties Epicure and Lucia showing lesions of *Phytophthora infestans* [*R.A.M.*, xix, p. 300] of varying size were planted in pots in Leningrad in 1931, it appeared that the emergence depended on the number of healthy eyes in the tubers, as eyes situated within the lesions either rotted before sprouting or gave rise to sprouts which rotted before or soon after reaching the soil surface. In soil with high humidity (80 per cent. saturation) the germination of diseased tubers of Early Rose was greatly depressed, and the humidity factor is considered to be of greater importance than the degree of infection. Under natural conditions in the field infection is localized and does not spread from an infected top bud to other parts of the plant or from diseased seed tubers to the young daughter tubers. It was proved experimentally that the fungus in the remains of diseased tubers in the soil retains its virulence for at least one vegetative season and sporulates on the surface of the soil, when the remnants are brought up by cultural methods or by earthworms. It is suggested that the conidia thus formed and also those produced on infected sprouts are responsible for the infection of potato plants in the field. Diseased leaves and tubers collected in the autumn and stored for the winter in a dry state were successfully used in the following spring for inoculating potato stems, whereas diseased material left to overwinter in the plot gave no infection. This result is held to indicate that the overwintering of *P. infestans* in the field is not impossible under certain, as yet undetermined, conditions of temperature and humidity. The part played by oospores remains obscure.

DYKSTRA (T. P.). **The Potato wart eradication program in Pennsylvania.**—*Plant Dis. Reptr*, xxiv, 1, pp. 7–8, 1940. [Mimeographed.]

A comprehensive programme for the eradication of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xviii, pp. 704, 707; xix, p. 202] is now being carried out in Pennsylvania. Affected gardens are treated with ammonium thiocyanate or flaked copper sulphate at 2,000 or 2,500 lb. per acre, respectively. The treated gardens are planted with susceptible varieties during the first week in July, and the crops are harvested at the end of October, when each tuber is examined. If no infection develops in five years it is assumed that the fungus has been eradicated. When all known infections have been treated in any area, the regulations are modified to permit the growing of susceptible varieties under a special permit, the crop being gathered only under strict supervision. During the harvesting of susceptible varieties in treated gardens the author did not observe even one infected tuber.

At present, the potato wart quarantine areas in Pennsylvania include the whole of 4 townships and 40 scattered towns and villages in 13 counties, but the disease is wholly restricted to home gardens, of which

928 are known to be contaminated. Treatment has been applied to all known affected gardens in 8 areas, and after 5 years' checking of all plantings therein without finding any evidence of the disease, the Department of Agriculture has authorized the removal of the quarantine at these points. All the evidence indicates that the disease will in time be completely eradicated from the areas where treatment has been applied.

JØRSTAD (I.). **Potetkreftens utbredelse i Norge og fortegnelse over Potetsorter prøvd mot kreft.** [The distribution of Potato wart in Norway and a list of the Potato varieties tested against it.]—*Meld. Plantesykd. Land- og Hagebr.*, *1939*, 56 pp., 1 map, 1939.

Since the first detection of potato wart (*Synchytrium endobioticum*) in Norway in 1914, fresh cases have been notified almost every year, ten administrative areas being now involved, mostly near the coast. The legislative measures in force against the disease since 1928 (the period up to which year was covered by the writer's previous survey [*R.A.M.*, ix, p. 52]) are recapitulated [ibid., xiv, p. 64], and an alphabetical list, accompanied by explanatory notes as to their origin and reaction to infection, is given of the varieties included in the immunity trials (greenhouse and field) from 1919 to 1939.

REID (W. J.), WRIGHT (R. C.), & PEACOCK (W. M.). **Prevention of damage by the seed-corn maggot to Potato seed pieces.**—*Tech. Bull. U.S. Dep. Agric.* 719, 37 pp., 4 figs., 1940.

The following references to the mycological aspect of the control of the seed-corn maggot (*Hylemyia* [*Phorbia*] *cilicrura*) on potato seed pieces occur in this paper, the investigations reported in which cover the period from 1925 to 1933. In addition to *Bacillus phytophthorus* [*Erwinia phytophthora*: *R.A.M.*, xix, pp. 113, 360], the following organisms have been found in association with the insect at various times: *Fusarium oxysporum* by F. Weiss from North Carolina material in 1924 (*in litt.*); *Actinomyces scabies*, *Rhizopus nigricans*, and *F. martii minus* [*F. solani* var. *martii* f. 1] by the same worker from South Carolina samples in 1926; and species of *F.*, *Penicillium*, *Mucor*, and *Alternaria* by Lillian C. Cash from North Carolina seed pieces in 1932 (*in litt.*). In comparative experiments with suberized and freshly cut seed pieces, infection by *F. coeruleum* was responsible for losses of stand and probably also for reduction of yield in the former lots.

BONDE (R.). **The role of insects in the dissemination of Potato blackleg and seed-piece decay.**—*J. agric. Res.*, lix, 12, pp. 889–917, 9 figs., 1939. [Received April, 1940.]

Studies [which are fully described] carried out in Maine to determine the part played by insects in the spread of potato blackleg and seed-piece decay (*Erwinia carotovora*) [see preceding abstract] showed that planted seed pieces may be attacked by the seed-corn maggot *Hylemyia* [*Phorbia*] *cilicrura* and the seed-potato maggot (*H.* [*P.*] *trichodactyla*). Soft rot and other pathogenic bacteria are intimately associated with the different stages in the development of *P. cilicrura* in Maine and South Carolina, and were isolated from the surface of the

eggs, and from within the puparia and the adult. Bacteria capable of causing blackleg and decay were isolated from puparia of *P. cilicrura* overwintered in potato fields. Blackleg and seed-piece decay were produced under laboratory conditions by inoculations with both insects in Maine, while in South Carolina under similar conditions *P. cilicrura* successfully inoculated potato seed pieces and slices with *E. carotovora* and other pathogenic bacteria, though adults of this insect failed to inoculate potato seed pieces by mere contact under field conditions in South Carolina. The insects were not observed in potato bins.

The evidence showed that *P. cilicrura* and *P. trichodactyla* do not attack seed pieces unaffected by decay, but are attracted to bacterial lesions or injuries due to fertilizer burns or desiccation; they were not attracted to lesions due to fungi and free from bacteria. In South Carolina the young infected larvae of *P. cilicrura* enter shallow surface lesions on unsuberized seed pieces planted in moist, warm soil, and increase the decay by burrowing, complete destruction resulting if the soil moisture content is high. In southern areas injury caused by the insects can be obviated by suberizing the cut seed. In Aroostook County, Maine, seed pieces do not usually develop surface lesions from soil contamination, attack by both insects taking place through lesions on potatoes still in the bin before planting. Freshly cut potato seed may be planted in Aroostook County with no danger of injury by the insects.

HAASIS (F. W.). **The distribution of Phytomonas sepedonica in Potato seed-pieces, plants and tubers, and its significance.**—*Mon. Bull. Calif. Dep. Agric.* xxix, 1, pp. 16–20, 4 diags., 1940.

Reed's rapid Gram stain method was applied to an analysis of the distribution of *Phytomonas sepedonica* [*Bacterium sepedonicum*] in various organs of the potato plant [*R.A.M.*, xviii, p. 201; xix, p. 361] in Kern County, California. The bacterial population was found to vary greatly in density in the different parts of a plant and in a single tuber, with a general tendency towards a gradient from a heavier incidence near the seed piece to a lighter one in the upper portion of the plant and from larger numbers near the stem end of the tuber to smaller ones approaching the crown end. This mode of distribution would appear to be a corollary of the general restriction of the bacteria to the vascular region of living plant parts.

The wilting of plants in the field at an advanced stage of maturity is evidently caused by the occlusion of the water-conducting vessels by the bacterial masses, the accumulation of which in sufficiently large numbers to produce the effect in question occupies a considerable period. The divergences between individual tubers in respect of bacterial numbers are presumably correlated with similar differences in the seed pieces and resulting vines.

DYKSTRA (T. P.), GOSS (R. W.), & LEACH (J. G.). **The distribution of ring rot of Potatoes (Phytomonas sepedonica) in the United States.**—*Plant Dis. Reptr*, xxiv, 1, pp. 2–6, 1 map, 1940. [Mimeographed.]

A survey made to ascertain the distribution of potato ring rot (*Phytomonas sepedonica*) [*Bacterium sepedonicum*: see preceding

abstract] in the United States showed that the disease is known to be present in 27 States, and constitutes a real menace. Letters received during the survey stated that in one field planted with certified seed 20 per cent. loss was sustained, that in some fields infection reached 100 per cent., that in one county potato acreage and production had been halved owing to the disease in three years, and that in one State the estimated loss from the disease in 1939 was probably $250,000. Opinion was almost unanimous that infection was introduced into the different states on imported seed stock. It is probable that the disease has been introduced into the United States comparatively recently; if so, it will become more widespread unless some effective method of checking it is applied at once. Every safeguard should be adopted against introducing the disease into new localities on seed stock transported from one State into another for experimental purposes.

The most suitable common name for the disease is considered to be 'ring rot' or 'bacterial ring rot', a direct translation of 'Bakterienringfäule'.

Discussing the problems requiring attention, the authors consider that a promising means of control would appear to lie in the disinfection of the seed pieces after instead of before cutting. There is no experimental evidence to support the general assumption that the pathogen does not survive in the soil [ibid., xix, p. 236]. With the increased efficiency of virus disease control through certification, the use of whole, small tubers for seed purposes may possibly be found desirable. All the evidence shows that *Bact. sepedonicum* is very highly infectious; for this reason, the disinfection of containers, storehouses, and machinery is important. As infected plants or tubers may show very little injury, and such tubers may produce badly diseased plants, a more accurate method for determining infection must be found if seed certification is to be effective. A campaign to instruct growers in the dangers of the disease and the possibilities of control is also necessary.

KAWAI (I.). **On the inclusion bodies associated with the stripe disease of Rice plants.**—*Ann. phytopath. Soc. Japan*, ix, 2, pp. 97–100, 5 figs., 1939. [Japanese. Abs. in *Biol. Abstr.*, xiv, 3, p. 526, 1940.]

The writer has recently detected in the mesophyll, and sometimes in the motor cells, of rice plants affected by stripe disease [*R.A.M.*, xvii, p. 768] inclusion bodies, 1·5 to 4·5 by 1·5 to 3 μ, situated near the larger nuclei and distinguishable from chloroplasts by a pale coloration on staining. These elements are a little smaller than those associated with dwarf, the only other virus disease of rice known in Japan [ibid., xviii, p. 613].

YOSHII (H.). **Some of the physical and chemical differences found in the inner and outer halves of a leaf blade of Rice in relation to Rice blast.**—*Ann. phytopath. Soc. Japan*, ix, 2, pp. 93–96, 1 fig., 1939. [Japanese. Abs. in *Biol. Abstr.*, xiv, 3, pp. 527–528, 1940.]

The lesions induced on rice foliage by the blast fungus (*Piricularia oryzae*) [*R.A.M.*, xix, p. 362] tend to be more numerous on the inner (broad) than on the outer (narrow) half of the leaf blade, resistance to needle puncture of the epidermal cell walls (as proved by the Jolly

balance) and silica accumulation in the cell walls (as shown by the Spodogram method), both of which factors are concerned in the capacity to withstand infection, being greater in the latter than in the former.

Burges (A.). **Soil fungi and root infection—a review.**—*Broteria*, viii, 2, pp. 64–81, 1 graph, 1939.

This is a concise survey of the information available to date on the relation of soil fungi to root infection [cf. *R.A.M.*, xvii, p. 625], most of the papers to which reference is made having been noticed from time to time in this *Review*.

Sabet (Y. S.). **On some fungi isolated from soil in Egypt.**—*Bull. Fac. Sci. Egypt. Univ.* 19, pp. 61–112, 45 figs., 1939.

Descriptions are given of the cultural and diagnostic characters of 86 Egyptian soil fungi, nearly all of which were mentioned by name in the author's preliminary paper [*R.A.M.*, xv, p. 314], where only three new species described therein, however, were figured.

Leeper (G. W.) & Swaby (R. J.). **The oxidation of manganous compounds by micro-organisms in the soil.**—*Soil Sci.*, xlix, 3, pp. 163–168, 1 pl., 1940.

Using the technique devised by Gerretsen [*R.A.M.*, xvi, p. 596] with some minor modifications, the writers investigated the role of micro-organisms in the oxidation of manganous compounds in samples of eight types of Australian soil, six of which are associated with manganese deficiency disease (grey speck) of oats.

The results of the experiments lent some support to Gerretsen's claim that the maximum incidence of the disease in soils with a P_H range of 6·5 to 7·5 is connected with the facility of microbial oxidation of bivalent manganese within these limits, though his upper one is considered to be too low in view of the fact that the most strongly 'deficient' type in the country (the calcareous soil of Corny Point, South Australia) has a hydrogen-ion concentration of P_H 8. Bacterial oxidation, however, is only one aspect of the manganese deficiency problem, some of the densest and most rapidly formed rings of manganic oxide developing on soil-agar plaques from non-'deficient' samples. In connexion with the absence of microbial formation of manganic oxide on very alkaline plaques, it is mentioned that manganese deficiency disease rarely occurs in soils with a P_H value above 8: the senior author (in unpublished investigations) has found that the growth of oats on 'deficient' soil may be greatly improved by raising the P_H above 8·5 with caustic soda.

Chang (S. C.). **Assimilation of phosphorus by a mixed soil population and by pure cultures of soil fungi.**—*Soil Sci.*, xlix, 3, pp. 197–210, 1 graph, 1940.

In cultural studies at the New Jersey Agricultural Experiment Station on the assimilation of phosphorus by soil micro-organisms (mixed and separately), a species of *Trichoderma* throve in the presence of high concentrations of phosphate, whereas a grey *Penicillium* was active at medium to low ones. Using glucose as a source of energy, the

fungi were found to synthesize considerably more organic phosphorus per unit weight of mycelium in a 1·5 than in a 0·5 per cent. solution, the nitrogen contents of the mycelium ranging from 5 to 7 per cent. *P.* sp. synthesized up to 6 per cent. organic phosphorus in a 1·5 per cent. phosphate solution, giving a 1 : 1 ratio of organic nitrogen to organic phosphorus, the corresponding amounts for *Rhizopus nigricans*, *T.* sp., and *Aspergillus* sp. ranging from 3 to 4 per cent. Mineralization of organic phosphorus, presumably accompanying autolysis, took place in all the cultures except those of *R. nigricans* at both phosphate concentrations, and was most pronounced for the three cellulose-destroying fungi (*T.* sp., *A.* sp., and *P.* sp.) after 21 days. These organisms, unlike *A. niger* and *R. nigricans*, were not adversely affected by the presence in the medium of large amounts of phosphate.

KATZNELSON (S.). **Survival of micro-organisms inoculated into sterilized soil.**—*Soil Sci.*, xlix, 3, pp. 211–217, 1940.

Some typical soil fungi and other micro-organisms were inoculated singly and in combination into steam-sterilized Palouse silt loam soil at the New Jersey Agricultural Experiment Station. Three plant-pathogenic fungi, *Rhizoctonia* [*Corticium*] *solani*, *Helminthosporium sativum*, and *Fusarium culmorum*, were able to develop in the sterilized soil: the two former were adversely affected by combination with two bacteria (*Bacillus cereus* and *Pseudomonas fluorescens*) or two Actinomycetes (*Actinomyces cellulosae* and *A. fradii*), whereas *F. culmorum* sustained no appreciable injury from similar associations. It is suggested that the application of mutual antagonisms of this type to the biological control of soil-borne plant pathogens may be a fruitful line of approach to the problem.

HEIM (R.). **Un Agaric rhizomorphique parasite des semis de Quinquina en Haute-Guinée.** [A rhizomorphic Agaric parasitic on *Cinchona* seedlings in Upper Guinea.]—*Rev. Bot. appl.*, xx, 222, pp. 77–87, 2 figs., 1940.

In April, 1939, the author examined a number of seedlings of *Cinchona succirubra* and *C. ledgeriana* growing in frames at Macente, Upper Guinea, and affected by a form of 'damping-off' which attacked them when the two first leaves were 4 to 5 mm. long. The condition was due to a very small Agaric emitting numerous whitish rhizomorphs which spread through the beds, the mycelium penetrating the deeper tissues of the host.

The stipes were dirty white, not over 22 mm. high, and tapered from a diameter of not more than 3 (occasionally 4) mm. at the base to one of 0·7 mm. at the apex. They generally terminated in a minute, markedly involuted, dark bluish-grey pileus, less than 3 (in exceptional cases up to 4) mm. in diameter; beneath this the sterile hymenium was composed of approximately 24 pliciform, thick, widely spaced, markedly decurrent, whitish lamellae. The whitish, odourless flesh was continuous and non-separable from stipe to pileus. From the base of these structures, which were generally isolated but occasionally united in twos or threes, milky-white, branched rhizomorphs up to 250 μ in diameter spread through the soil, forming a network.

The young hymenium showed piriform-elongated basidial cells 6 μ wide, with no sterigmata and no sign of sporulation.

While the author was unable to identify the species as the basidia studied were too immature, he considers that it may be a *Clitocybe*, and briefly discusses other rhizomorphic Agarics and Basidiomycetes parasitizing plants.

The following control measures are recommended; removal and destruction of the fungi and the rhizomorphs as they appear; aeration of the plants in the shade for one or two hours on sunny days, and exposure to the sun for a suitable period; and partial soil sterilization before planting, with chemicals, natural heat, or steam.

Martin (J. P.). **Pathology.**—*Rep. Hawaii. Sug. Exp. Sta., 1939* (ex *Proc. Hawaii. Sug. Pl. Ass., 1939*), pp. 28–42, 1940.

In this report [cf. *R.A.M.*, xviii, p. 477] it is stated that the most important sugar-cane diseases in Hawaii at present are leaf scald (*Bacterium albilineans*) and chlorotic streak, with an occasional outbreak of eye spot (*Helminthosporium sacchari*). On the island of Maui eye spot is the principal disease, while leaf scald and chlorotic streak are only of localized importance. The most serious diseases in Kauai and Oahu are eye spot and brown stripe (*Cochliobolus stenospilus*) [the ascigerous stage of *H. stenospilum*], though in the last few months chlorotic streak has become somewhat more serious than before on some varieties in parts of Kauai. Mosaic is becoming of minor importance, as a result of the planting of resistant varieties, selection of healthy planting material, and improved weed control.

In a varietal resistance test, in which healthy and diseased cuttings of 23 varieties were planted, several varieties, including 31–2484 and 31–2510, showed marked tolerance towards chlorotic streak, while others, including P.O.J. 2878, D. 1135, Olaa 3055 and 32–1063 showed little tolerance, as indicated by the depressed growth in the plots planted with diseased cuttings.

Transmission of chlorotic streak occurs by means of cuttings and may be eliminated by hot-water treatment before planting, which also stimulates germination and early growth in cold, wet conditions. In almost every instance, treatment at 52° C. for 20 minutes has given 100 per cent. healthy stands. [In *R.A.M.*, xvi, p. 561, the record of the symptoms of chlorotic streak on elephant grass (*Pennisetum purpureum*) was given in error as on *Typha elephantina.*]

Leaf scald varietal resistance tests clearly demonstrated that most of the local varieties are commercially resistant and that very susceptible varieties can easily be detected by the external and internal symptoms which they develop. The disease was less severe than in previous years, and the use of resistant varieties is again suggested.

Red stripe [*Bact. rubrilineans*] is limited almost exclusively to the Kohala area, and, with the decline of the Tip canes here, is becoming much less serious.

Parris (G. K.). **A check list of fungi, bacteria, nematodes, and viruses occurring in Hawaii, and their hosts.**—*Plant Dis. Reptr, Suppl.* 121, 91 pp., 1940. [Mimeographed.]

Since the publication of F. L. Stevens's monograph on Hawaiian

fungi in 1925 [*R.A.M.*, v, p. 251], data relative to plant pathogens in the islands have accumulated and are here presented in two parts, viz., (1) an alphabetical list of plant hosts (under their scientific names) with the organisms reported on each, and (2) the organisms segregated into their respective systematic groups—fungi, bacteria, nematodes, and viruses—with the hosts on which they occur. The bibliography comprises 71 titles.

Wehmeyer (L. E.). **Contributions to a study of the fungus flora of Nova Scotia. IV. Additional Basidiomycetes.**—*Canad. J. Res.*, Sect. C., xviii, 3, pp. 92–110, 1 pl., 1 fig., 1940.

This list of 134 Basidiomycetes collected in 1931 and 1933 in Nova Scotia (chiefly in Colchester County) is noteworthy for the large number of Polypores. *Stereum purpureum* [*R.A.M.*, xix, p. 239] is reported on *Salix* and *Stereum sanguinolentum* was commonly found on dead standing *Abies balsamea* [ibid., xvi, p. 77].

Naito (N.). **Studies on septorioses of plants. VII. New or noteworthy species of Septoria found in Japan.**—*Mem. Coll. Agric. Kyoto*, 47, pp. 31–43, 1 pl., 1940.

This is a critically annotated list of 22 species of *Septoria*, including 12 new ones, collected since the spring of 1935 on flowering plants in the vicinity of Kyoto, Japan.

Naito (N.). **Notes on some new or noteworthy fungi of Japan.**—*Mem. Coll. Agric. Kyoto*, 47, pp. 45–52, 4 figs., 1940.

This is a critically annotated list of 13 new or otherwise noteworthy leaf-spotting fungi collected since the spring of 1935 in Japan (mostly in the Kyoto Prefecture). *Heterosporium albizziae* (Petch) Naito n. comb. (*Helminthosporium albizziae*), found for the first time in Japan, producing circular, pale yellow or blackish spots, 0·5 mm. in diameter, on the foliage of *Albizzia julibrissin*, is characterized by fasciculate, fuliginous conidiophores, 33 to 60·8 by 8·7 to 10·4 μ, and straight or slightly curved, bi- to triseptate, minutely verrucose, fuliginous conidia, 27·8 to 52·1 by 8·7 to 10·4 μ.

Vladimirskaya (Mme M. E.). Паразит ржавчины сельскохозяйственных растений—**Tuberculina persicina (Ditm.) Sacc.** [A parasite of rusts of cultivated plants, *Tuberculina persicina* (Ditm.) Sacc.]—*Bull. Pl. Prot., Leningr.*, *1939*, 1, pp. 103–110, 1 graph, 1939. [Received April, 1940.]

Tuberculina persicina [*R.A.M.*, xviii, p. 528] was isolated in pure culture from uredo-pustules of *Puccinia suaveolens* from *Cirsium arvense*. Abundant spore germination occurred on slices of carrot, seeds of pea, soy-bean, maize, and rice, and on milk and beer wort agars at temperatures between 9° and 28° C. (most rapidly at 15° to 25°), the period required for sporulation varying, on favourable media, from 8 to 15 days. Media most favourable for the mass cultivation of the fungus are those containing a large proportion of sugars and little protein. Inoculations of the spermogonial and aecidial stages of *P. dispersa* on *Anchusa officinalis* and *P. graminis* on barberry with cultures

of *T. persicina* yielded positive results after an incubation period of 7 to 8 days, resulting in an inhibition of further development of the rusts; negative results were obtained with inoculations of uredosori.

REMSBERG (RUTH E.). **Studies in the genus Typhula.**—*Mycologia*, xxxii, 1, pp. 52–96, 58 figs., 1940.

As a result of cultural studies on various species of *Typhula*, it is suggested that this genus be used to include species with small, filiform, clavate sporophores which normally arise from sclerotia, and the separation of species within the genus chiefly based on sclerotial morphology. A revised description of the genus is given and *T. phacorrhiza* chosen as the new type species, being the most frequently collected and more completely described and illustrated than any other of the genus.

The author recognizes 14 species of *Typhula*, of which nine are new, and supplies a key and an annotated list of the species with Latin diagnoses for the new ones. She accepts *T. itoana* [*R.A.M.*, xix, p. 351] and states that comparative cultural studies of the organism received from Japan showed it to agree with that from the United States; the organism causing the same type of disease of cereals and grasses in northern Europe, previously identified as *T. graminum* [loc. cit.] also proved to be identical with *T. itoana* and so did *Sclerotium fulvum* [loc. cit.] from the Roumeguère collection. An examination of sclerotia from the type material of *T. graminum*, however, showed their morphology to be entirely different from that of *S. fulvum* and *T. itoana*, the medulla being prosoplectenchymatous with a layer of enlarged thin-walled cells adjacent to the homogeneous, gelatinous rind; furthermore, the sporophores are white instead of coloured. It would appear, therefore, that *T. itoana* is distinct from *T. graminum*.

The new species *T. umbrina*, found on turnips in cold storage and on leaves and rhizomes of *Iris*, is described as having brown, later black, sclerotia, 0·5 to 4·0 mm., with a reddish-brown cortex 7 to 12 μ thick; clavate, erect, simple, straight or slightly curved sporophores, 8 to 15 mm. high; elongated, four-spored basidia, 31 to 39 by 5·8 to 7·8 μ; and ovate basidiospores, 11·7 to 15·6 by 3·9 to 7·8 μ or on the average 12·5 by 5·5 μ. The fungus causes a mild necrosis and is possibly weakly pathogenic.

T. variabilis [ibid., xii, p. 416] (among the synonyms of which *S. semen* [ibid., viii, p. 597] and its var. *brassicae* are of interest) is reported as causing a very destructive disease of sugar beets and potatoes in Europe and the Azores, and also being weakly pathogenic on stored celery. Artificial infection was successful on the abovementioned hosts and asparagus rhizomes. In culture the fungus grows over a range of 0° to 21° C. with an optimum at 12° to 15°; mycelial growth is appressed, woolly to powdery, and inconspicuous; sclerotia are produced in 7 to 14 days and are single or coalesced into masses, white when young, later mahogany-red to chestnut brown. The new species *T. idahoensis* [ibid., xix, p. 351] is stated to cause a disease of cereals and grasses similar to that caused by *T. itoana* and is often collected in the same field, but is readily distinguished by its sclerotial colour, which is light amber at first and chestnut-brown at maturity.

The organism grows in culture over a range of 0° to 18° with an optimum at 9° to 12°; mycelial growth is abundant, fluffy, and concentrically banded; the sclerotia, which appear after 5 to 10 days, are clustered or in concentric rings, and always single; and the sterile brown sporophores develop from sclerotia abundantly.

HOERNER (G. R.). **A nomenclatorial note on Pseudoperonospora.**— *J. Wash. Acad. Sci.*, xxx, 3, pp. 133–134, 1940.

On the basis of priority, and following the present generally accepted rules of nomenclature, Rostoffzeff's generic name *Pseudoperonospora* (*Flora, Jena*, xcii, pp. 405–430, 1903) antedates Clinton's elevation (*Rep. Conn. agric. Exp. Sta., 1904*, pp. 329–362, 1905) of Berlese's subgenus *Peronoplasmopara* (*Riv. Pat. veg.*, ix, pp. 123–126, 1901) to generic rank, and the author therefore upholds the validity of *Pseudoperonospora* and transfers to it three species, the systematic position of which is obviously proclaimed by their characteristics, including *Peronospora cannabina* as *Pseudoperonospora cannabina* (Otth) n. comb.

DRECHSLER (C.). **Three species of Pythium associated with root rots.**— *Phytopathology*, xxx, 3, pp. 189–213, 8 figs., 1940.

Pythium dissotocum, originally described by the author from sugar-cane roots in Louisiana [*R.A.M.*, x, p. 211], but also isolated on various occasions from peas [ibid., iv, p. 456; v, p. 69], *Pilea pumila*, beet, and spinach, produces in pure culture, e.g., on Lima bean agar, an abundance of zoosporangia, many of which consist of undifferentiated filaments, while others include a number of distended lateral branches. These organs give rise to immense numbers of zoospores, of which 50 to 125 may be formed in each vesicle, with a marked proclivity to itinerant swarming. The antheridial relationships of the species are comparable to those typified by *P. de Baryanum* and *P. ultimum*. The oogonial and oospore diameters of *P. dissotocum* on maize meal agar range from 12 to 32 (mostly 21) μ and 11 to 27 (17) μ, respectively.

The zoosporangia of *P. periilum*, also from sugar-cane in Louisiana, are richer in swollen elements than those of *P. dissotocum*. Its oogonium is copiously and closely inwrapped by a branching antheridial filament in much the same way as in *P. scleroteichum*, the agent of a labyrinthine root rot of sweet potato [ibid., xiv, p. 467], and in various terrestrial species of *Aphanomyces*. The oogonial and oospore diameters of *P. periilum* range from 16 to 22 (mostly 19) μ and 14 to 20 (17) μ, respectively.

P. paroecandrum, isolated from field garlic (*Allium vineale*) and *Sanguinaria canadensis* in Virginia and from *Impatiens pallida* in the District of Columbia, produces subspherical zoosporangia resembling those of *P. de Baryanum*. As implied in the Greek specific name, the antheridia often arise in close contiguity to the oogonium, in which respect *P. paroecandrum* shows a strong affinity with *P. ultimum*, though the internal organization of the oospore, with its fairly large reserve globule, is more in conformity with that of *P. de Baryanum*. The oogonial and oospore diameters of *P. paroecandrum* are 11 to 27 (mostly 21) μ and 10 to 22 (18) μ, respectively.

Baldacci (E.). **Revisione delle specie : Actinomyces albus, A. chromogenus, A. odorifer, A. thermophylus, A. viridis, A. viridochromogenes, A. hominis, A. innominatus.** [A revision of the species *Actinomyces albus, A. chromogenus, A. odorifer, A. thermophylus, A. viridis, A. viridochromogenes, A. hominis, A. innominatus.*]—*Mycopathologia*, ii, 3, pp. 145–161, 2 pl., 1940. [English summary.]

Continuing his studies on the systematic position of Actinomycetes [*R.A.M.*, xix, p. 45], the author re-describes *A. albus* (of which 30 synonyms are listed, including *A. chromogenus*, and five varieties are recognized), *A. viridis* Pelleg. (with five synonyms including *A. viridis* Millard & Burr), and *A. innominatus* (a new name for *A. hominis* Bostroem, *A. hominis* Auct. being regarded as a *nomen ambiguum*). *A. chromogenus*, *A. odorifer*, and *A. thermophylus* have many biological characters in common with other species of the genus, which may be used for sub-specific differentiation only. *A. albidoflavus* and *A. aureus* were found to belong to the *flavus* group, which requires revision. Some strains classified as *A. farcinius* doubtless should be referred to *A. albus*, but the real specific entity remains to be revised from Nocard's strain.

Castellani (E.) & Ciccarone (A.). **Osservazioni su un micromicete del 'Ciat' ('Catha edulis' Forsk.)** [Observations on a fungus of 'Khat' (*Catha edulis* Forsk.).]—*Nuovo G. bot. ital.*, N.S., xlvi, 4, pp. 611–614, 1 fig., 1939. [Issued February, 1940.]

Examination of numerous specimens of *Catha edulis* [the leaves of which are used for making African tea] from Harar, Abyssinia, infected by a fungus referred by Elisei to *Cycloschizon pollaccii* Elisei showed the presence on the leaves and branches of sparsely arranged or loosely aggregated, round or subelliptical, slightly raised, easily detachable, black crusts, 0·6 to 1 mm. in diameter, on a central, deep olivaceous, subepidermal foot, 80 to 110 μ wide and 45 to 60 μ long. The hypothecium was lighter in colour, and the clavate, hyaline or slightly fuliginous asci, separated by a fibrous, paraphysoid tissue of smoky colour, were arranged in one ring-shaped locule surrounded by the central depression of the ascostroma. The ovoid-elongated, hyaline, later dark olivaceous ascospores measured 26 to 30 by 10 to 12 μ, and were regularly uniseptate, constricted at the septum, and showed an upper cell slightly wider than the lower.

In view of the fact that all those workers who have examined the type species of *Cycloschizon* (*C. brachylenae* (Rehm) P. Henn.) state that the spores of this genus are hyaline, and as von Höhnel maintains that *Cycloschizon* and *Dielsiella* are both valid genera, the former having hyaline and the latter dark spores, the authors rename the fungus *Dielsiella pollaccii* (Elisei) Cicc. & E. Cast. n. comb.

Berkeley (G. H.) & Koch (L. W.). **Diseases of Tobacco in Canada.**—*Fmrs' Bull. Canad. Dep. Agric.* 85, 29 pp., 19 figs., 1940.

Popular notes, incorporating the latest available information, are given on a number of fungal, bacterial, virus, and physiological diseases of tobacco in Canada and their control [*R.A.M.*, xvii, p. 560].

WOODS (M. W.). **Reversible inhibition of Tobacco mosaic virus in living cells with 0·002 molar sodium cyanide.**—*Science*, N.S., xci, 2360, pp. 295–296, 1940.

Detailed studies have shown that protoplasmic streaming in leaf cells of tobacco is oxygen-sensitive, and that the rate of streaming can be reversibly inhibited by sodium cyanide. The tobacco leaf can, however, be kept alive for several days by alternate immersion in a 0·0002 μ solution of sodium cyanide and dialysing with water. When tobacco leaves were inoculated with a single-lesion strain of severe mottling tobacco mosaic virus and one half treated with a 0·0002 M sodium cyanide solution, it was shown that multiplication of tobacco mosaic protein was strongly inhibited (up to 73·2 per cent. reduction in virus concentration). Since in all experiments protoplasmic streaming was still active in the leaf cells at the end of the test, reduction of virus multiplication cannot be attributed to death of cells during treatment. Measurements of virus concentration made 25 hours after cessation of cyanide treatment showed that virus multiplication had been resumed. Detached leaves of an F_2 necrotizing hybrid (*Nicotiana tabacum* × *N. glutinosa*), which usually develop necrotic spots 60 to 75 hours after inoculation when held in air or immersed in oxygenated water, showed none after 70½ hours when treated with 0·0002 M sodium cyanide for a total of 53 hours, the lesions appearing only after the treatment had been stopped for 50 hours. The tobacco mosaic virus responds to 0·0002 M sodium cyanide in much the same way as certain haemin-containing catalysts, indicating that the virus mechanism either depends on the activity of haemin-containing respiratory catalysts of the cell or the virus protein itself may contain haemin or some similar structural unit that can be blocked reversibly with cyanide.

PFANKUCH (E.), KAUSCHE (G. A.), & STUBBE (H.). **Über die Entstehung, die biologische und physikalisch-chemische Charakterisierung von Röntgen- und γ-Strahlen induzierten 'Mutationen' des Tabakmosaikvirus.** [On the origin and the biological and physico-chemical characterization of the 'mutations' of the Tobacco mosaic virus induced by Röntgen and γ-rays.]—*Biochem. Z.*, ccciv, 4, pp. 238–258, 6 figs., 1940.

A convenient stage has now been reached in the writers' studies at the Biological Institute, Dahlem, Berlin, on the tobacco mosaic 'mutations' experimentally induced by exposure to X- and γ-rays [*R.A.M.*, xix, p. 358] to sum up the results obtained to date.

The aberrant forms of the virus arising through the irradiation of a mesothorium preparation with 12,000 to 14,000 Röntgen units or γ-rays are not to be interpreted as portions of the normal tobacco mosaic virus molecule. Their basic molecular weight approximates to that of the normal virus, but certain forms show a stronger tendency to polymerization, while the solubility and hydratation relationships of the 'mutants' can be differentiated from those of the normal by a simple nephelometric method. Evidence is adduced for the development of the new forms in the nucleic acid portion of the virus molecule, where they are conditioned by quantitative and qualitative changes.

Biological analysis showed that the symptoms produced by the 'mutants' on Samson tobacco leaves are quite distinct from those due to the normal mosaic virus. TM 44, for instance, gave rise in the first place to diffuse but circumscribed yellow spots, followed on the next developing leaves by a secondary pattern consisting in a complete bleaching of the leaf veins and the portions of the blade adjoining them on either side, while the intercostal areas remained green. The tertiary symptom was a sharply defined, coarse or fine mosaic ranging in colour from pure white through yellowish-green to very dark green. The incubation periods of the variants were almost always longer, sometimes considerably, than those of the normal virus. Qualitatively the activity of TM 44 and 46, as well as that of TM 88 (radium), was substantially increased, while TM 50 and 58 were much reduced in this respect. Quantitatively the titres mostly lay below those of the normal virus.

Both in their structure and activities the phytopathogenic viruses are considered to present certain analogies with genes [loc. cit.], and the nature of the physico-chemical changes in the material under observation points to definite mutational processes in the genetic sense, i.e., alterations in the intramolecular condition.

Bortner (C. E.) & Karraker (P. E.). **Studies of frenching of Tobacco, with particular reference to thallium toxicity.**—*J. Amer. Soc. Agron.*, xxxii, 3, pp. 195–203, 2 figs., 1940.

In experiments at the Kentucky Agricultural Experiment Station the addition of thallium to Turkish tobacco plants in water, sand, and soil cultures uniformly caused chlorosis, which assumed several forms, none of them entirely resembling frenching as it occurs in the field [*R.A.M.*, xviii, p. 716]. Thus, thallium-induced chlorosis appears in the tissues of the leaf base and along the larger veins, whereas the field symptoms originate in the interveinal tissue of the apical margin. Moreover, thallium-induced chlorosis may first develop in the larger leaves, while the onset of frenching is confined to the top foliage of the main plant or the suckers.

The amounts of the mineral required to cause chlorosis varied in the different forms of culture, 0·04 p.p.m., for instance, sufficing in water, while larger quantities were generally necessary in sand, and much heavier applications (up to 38 p.p.m.) were needed in soil; in one series a total of 28 p.p.m. failed to induce the condition. These figures represent an excess of thallium unlikely to be found in nature.

Thallium treatments neither accelerated frenching in soils in which the disease occurs spontaneously nor produced it under conditions where it is normally absent. Liming and a low nutrient content, which tend to produce frenching, did not increase thallium chlorosis.

Wolf (F. A.), McLean (Ruth), Pinckard (J. A.), Darkis (F. R.), & Gross (P. M.). **Volatile fungicides, benzol and related compounds, and the principles involved in their use.**—*Phytopathology*, xxx, 3, pp. 213–227, 2 figs., 3 graphs, 1940.

Experiments in North Carolina and Virginia have shown that in certain seasons, such as the relatively warm and dry one of 1939, it is

not necessary to apply benzol every night to tobacco seed-beds in order to secure complete protection against downy mildew (*Peronospora tabacina*) [*R.A.M.*, xix, p. 306]. The length to which the interval between successive treatments can be protracted probably depends on the length of the sporangial cycle as modified by the prevailing weather conditions. 'Cotton balls', consisting of 30 gm. compacted non-absorbent cotton covered with cloth, dipped in benzol, constitute an effective means for the vaporization of the compound in seed-beds, one ball sufficing for each 4 sq. yd.

An increase in the permeability of the plasma membranes of tobacco seedlings was observed to result from exposure to benzol and paradichlorbenzene vapours. Concentrations of benzol ($\frac{1}{16}$ saturation), paradichlorbenzene ($\frac{1}{2}$), phenol ($\frac{1}{750}$), and aniline ($\frac{1}{75}$) closely approximate to the minimum toxic limits for the inhibition of sporangial germination in *P. tabacina*.

Discussing the principles governing the efficacy of fumigant fungicides, the writers have found that their action on and in the plant tissues takes place through the medium of their aqueous solutions, the concentrations effective against the pathogen being lower than those toxic to the host. Solubility in water is thus of primary importance in the utility of fungicides of this type for the end in view.

WOLF (F. A.) & MCLEAN (RUTH A.). **Sporangial proliferation in Peronospora tabacina.**—*Phytopathology*, xxx, 3, pp. 264–268, 1 fig., 1940.

In order to obtain adequate supplies of sporangia for their studies on *Peronospora tabacina* [see preceding abstract], the writers inoculated seedlings in glass jars, containing about 500 gm. steam-sterilized soil, with aqueous sporangial suspensions and then closed the jars with screw-cap tops. The vessels were then placed in an incubation chamber at 15° C. and subjected to continuous irradiation by a 25-watt bulb, under which abnormal conditions proliferated sporangia were produced, a phenomenon believed to be hitherto unknown among the Peronosporaceae. Several types of proliferation were observed. In some instances the inner sporangial wall protruded apically and became enlarged; in others a tube was formed that remained unbranched or branched dichotomously, producing from one to four small, secondary terminal sporangia, which may also proliferate in their turn. In other cases, again, the primary sporangium gave rise to a dichotomously branched sporangiophore bearing eight minute, immature, secondary sporangia, this last-named type of proliferation apparently having no counterpart among the related families of Phycomycetes, in which the process as a whole, however, is not uncommon. In *P. tabacina* proliferation is evidently related to the continuous humidity and weak illumination incidental to the experimental conditions, having never been observed in eight years' studies on the fungus on plants spontaneously infected out of doors.

DIACHUN (S.). **Relation of stomata to infection of Tobacco leaves by Bacterium tabacum.**—*Phytopathology*, xxx, 3, pp. 268–272, 2 figs., 1940.

Details are given of tests in the greenhouse and field at the Kentucky

Agricultural Experiment Station in 1939, the results of which showed that the stomatal condition of the leaves, examined by Lloyd's technique (*Publ. Carneg. Instn*, 82, 1908), is one of the determining factors in the extent of infection developing as a sequel to atomization with a suspension of *Bacterium tabacum* [*R.A.M.*, ii, p. 38]. During the day the stomata are usually open and inoculation produces heavy infection; at night or in artificial obscurity, on the other hand, they are mostly closed and only a few lesions are formed.

VIRGIN (W. J.). **The Chilean Tomato, Lycopersicon chilense, found resistant to curly top.**—*Phytopathology*, xxx, 3, p. 280, 1940.

In greenhouse and field tests in Idaho in 1939 *Lycopersicum chilense* remained completely free from curly top of beet [*R.A.M.*, xviii, pp. 64, 824] under conditions involving close contact with the insect vector of the disease (*Eutettix tenella*) and inducing severe infection in commercial varieties (Earliana in the greenhouse).

MOORE (W. D.). **Results of Tomato seedling disease investigations in Georgia, 1937–1938.**—*Canning Age*, xxi, 3, p. 124, 1940.

Spore trap studies on tomato collar rot and stem canker (*Alternaria solani*) [*R.A.M.*, xviii, p. 421] showed the pathogen to be widely distributed throughout the tomato-growing regions of Georgia, where the process of spore dissemination continues almost uninterruptedly throughout the year. General infection is favoured by high humidity and warmth. Bordeaux sprays have been found to cause injury to the seedlings during dry spells, and may be replaced during the current year by copper compound A or tribasic copper. The development of the disease appears to stand in direct relation to the age of the plants, so that local sowings should be made at intervals to meet the [seedling] requirements of northern markets. The incidence of canker on the seedlings is proportionate to the extent of wilting allowed between picking and packing in moss for shipment, indicating the importance of accelerating field operations so as to reduce wilting to a minimum. Experimental results and observations on local packing methods suggest the adoption of more stringent precautions in packing, using larger quantities of moss, possibly fewer plants per bundle, and taking greater care in the covering of the roots. The maintenance of a temperature range between 60° and 70° F. in the shipping crate has been found largely to prevent the development of infection in transit.

THOMAS (H. R.). **Collar-rot infection on direct-seeded Tomatoes.**—*Plant Dis. Reptr*, xxiv, 1, pp. 8–10, 1940. [Mimeographed.]

In 1939 observations were made in a 60-acre field in Indiana on the incidence of collar rot [*Alternaria solani*: see preceding abstract] on tomato plants 'direct-seeded' on land, some of which was planted to tomatoes in 1938, when the plants were severely attacked by the leaf spots due to *A. solani* and *Septoria lycopersici*. The only parts not sown to tomatoes in 1938 were strips about 50 ft. wide along two sides of the field, which were planted to soy-beans. In July, 1939, the amount of collar rot found was 5·9 and 0·4 per cent., respectively, in the parts sown to tomatoes and soy-beans the year before. Two rows of home-

grown plants set through the middle of the field about the time when the 'direct-seeded' plants were thinned showed 0·2 per cent. collar rot.

The first sign of disease consisted in necrotic spotting of the new growth. When affected plants were pulled up, typical collar rot lesions were noted on the stem just below the soil surface. No pathogenic organism was recovered from the spots but a similar condition has been experimentally induced by inoculation with spores of *A. solani*. The evidence suggested that enough inoculum of *A. solani* collected on the tomato debris of the previous season to produce the collar rot outbreak of 1939. Spread of spores and dead leaves by the wind in 1938 did not (in 1939) seriously affect the adjacent portion of the field that had been planted to soy-beans.

It is also stated that in 1938, in another locality where tomatoes are grown on the same land every year, approximately 80 per cent. of the tomato plants in a 'direct-seeded' field became affected by collar rot.

ORTH (H.). **Die Stengelfäule der Tomate.** [The stem rot of Tomato.]—*Kranke Pflanze*, xvi, 9–10, pp. 155–159, 1939.

In addition to information already presented from another source [*R.A.M.*, xviii, p. 636], the following facts concerning tomato stem rot (*Didymella lycopersici*) and its control in Germany are of interest. The disease is prevalent on heavy soils with a high humus content, such as the fertile plain of Magdeburg, where losses up to 70 per cent. of the crop have been observed. In this district infection may be largely reduced by a postponement of the normal sowing date to about the middle of March. In experiments in 1937 the incidence of stem rot on 2nd September in a stand sown on 20th April was 25 per cent. as against 58·8 per cent. in one sown on 25th February (the former date, however, would be too late for commercial practice).

An important factor in the successful control of the disease by watering with 0·1 per cent. mercuric chloride is the time of the first application, the most suitable conditions being provided in July by a drop in the temperature to 20° C. following heavy precipitation; another treatment should be given three to four weeks later. There can be no question as to the profitability of the treatment in cases where a severe attack appears imminent, the cost per plant (reckoning mercuric chloride at Rm. 10 per kg.) being only about Rm. 0·01. As regards indirect measures of combating the pathogen, the following experiment, carried out in a heavy black humus soil receiving liberal annual applications of stable manure (200 zentner per $\frac{1}{4}$ hect.) [nearly 16 tons per acre] and a complete mineral fertilizer, is of interest. By growing tomatoes as a 'second crop', i.e., in the year following manuring, the incidence of infection was reduced from 35 to 68 per cent. in 'normal' years to 0·7 per cent., whereas in the following year again, fresh applications of stable or peat manure caused a heavy increase of stem rot, which was practically absent from the synthetically fertilized and untreated plots.

TRUE (R. P.) & SLOWATA (S. S.). **Attempts to isolate Ceratostomella ulmi from stored Elm wood.**—*Phytopathology*, xxx, 3, pp. 272–274, 1940.

In September, 1936, living American elm branches, 1 to 4 in. in

diameter, infected by *Ceratostomella ulmi* [*R.A.M.*, xviii, p. 717] were cut into 611 1-ft. lengths and divided into three lots for storage under different field conditions. Lot 1 was placed on the ground in deep forest shade, lot 2 was laid on the grass in an unshaded area, and lot 3 was put on a rack 18 in. above the ground, exposed to direct sunshine for the greater part of the day. All bark was removed from half the pieces in each lot, and the side of each stick, showing at the cut ends the most severe discoloration due to the disease, was marked for subsequent cutting. In January, 1937, an attempt was made to isolate the pathogen on potato sucrose agar or in moist chambers at 60° F. from one-third of the total number of sticks representing the various methods of storage. At this stage the maximum percentage of positive results (95) was obtained from the heavily shaded sticks with bark adhering, and stored with the discoloured side downward, and the minimum (17) from those on the unshaded grass area, decorticated, and with the discoloured side upward. After attempted isolation the sticks were restored to their original environment. In May, 1938, the same procedure was repeated. The maximum percentage of infection (23) was again found among the shaded sticks with bark adhering and discoloration downward, the only other positive results being given by shaded sticks with bark adhering and discoloration upward (8 per cent.), those stored in grass with bark adhering and discoloration downward (2), and those placed in the rack, discoloured side downwards, decorticated (4) and bark adhering (2).

CARTER (J. C.). **Progress in the control of Elm diseases in nurseries.**—*Biol. Notes Ill. nat. Hist. Surv., 1939*, 10, pp. 1–19, 6 figs., 1939. [Abs. in *Biol. Abstr.*, xiv, 3, p. 528, 1940.]

Satisfactory control of elm leaf spots (*Phyllosticta* and *Mycosphaerella*) and anthracnose (*Gnomonia ulmea*) [*R.A.M.*, xviii, p. 146], accompanied by an increase in the commercial value of the trees, was obtained in Illinois in experiments over a period of several years involving more than 6,500 nursery trees by the following treatments: (1) summer dusting with kolodust; (2) summer dusting with flotation sulphur dust and mike sulphur [ibid., xviii, p. 598]; (3) dormant and summer spraying with instant Bordeaux [ibid., xiv, p. 349]; and (4) summer spraying with mike sulphur, pruning being a necessary adjunct to all the treatments except possibly No. 2. The sulphur dusts in general gave the most consistent results. Some of the treatments were also partially effective (30 per cent. or over) against the wilts caused by *Verticillium* [ibid., xviii, p. 281], *Coniothyrium* [ibid., xvii, p. 70 and loc. cit.], *Phoma* [ibid., xiv, p. 537], and *Cytosporina* [*ludibunda*: ibid., xvi, p. 71]. The first application of the fungicide should be made in late April or early May, followed by treatments at fortnightly intervals until the end of June (or mid-July under moist conditions), and thenceforward every three weeks until the end of August. Pruning should immediately precede each treatment.

KELLEY (A. P.). **The Chestnut blight and its relation to the principle of disease resistance.**—*Science*, N.S., xci, 2360, pp. 290–291, 1940.

Continuing the studies on chestnut blight [*Endothia parasitica*:

R.A.M., xviii, pp. 354, 827], the first report of which was published in 1924 [ibid., iv, p. 200], the author presents the following data on the survival of the American chestnut. The ratio of new growth to the length of stem and twig killed by blight, measured on trees of the permanent experimental plots, was 3 to 1 in 1926 and better than 2 to 1 in 1939. Stump sprouts have very little resistance to blight, and their rapid destruction has led to the popular belief that the chestnut is being exterminated; seedlings, on the other hand, proved highly resistant, many of them on the experimental plots having come through the 15 years of observation untouched or only little affected by blight. In a number of seedlings under observation blight had evidently entered through gunshot wounds inflicted by hunters. Shading is very detrimental to both seedlings and stump sprouts and a careful release cutting is recommended, for wherever this has been done the chestnut shoots into rapid and healthy growth.

In an attempt to explain the nature of resistance to blight in chestnuts, the author examined microscopically diseased and healed cankers: the former were found to contain abundant mycelium penetrating freely through the tissues, whereas the latter showed limited fungus growth with all stages of breaking-down of the fungus with the formation of 'digestion cells' and enlarged host nuclei. These results are held to indicate a development comparable to mycorrhiza, and it is furthermore suggested that the relation of fungus to host is dependent on the balance of osmotic pressures: the fungus penetrates into the host tissues as long as it can maintain a higher osmotic pressure than the host sap it encounters, but whenever it meets a higher one it is broken down and absorbed by the host cell. The resistant canker of the chestnut is thus one possessing greater osmotic values than the fungus, and the resistant seedlings are those of healthy, vigorous growth with salt-rich sap. Stump sprouts are, on the other hand, killed by the fungus because their root systems are not able to retain their vigour after the large trees which formerly supported them have been removed.

BONGINI (V[IRGINIA]). **Note fitopatologiche.** [Phytopathological notes.] —*Boll. Lab. sper. R. Oss. Fitopat., Torino*, xvi, 1–4, pp. 54–64, 3 pl., 1939 (issued 1940).

The fatal wilt of young rooted cuttings of *Cryptomeria japonica* var. *elegans* and *C. viridis* observed in nurseries in Turin in the winter of 1935–6, and associated with *Cladosporium laricis* and a species of *Phomopsis* [*R.A.M.*, xvii, p. 362], has continued to cause losses in cuttings taken from apparently healthy mother plants promptly removed from the affected nurseries to a distance of several hundred metres. As the progress of the disease is very slow, vegetation remains normal during the initial stages of mycelial growth, and this accounts for the spread of infection by means of apparently healthy cuttings. Spraying failed to give satisfactory control, and the only cultural practice found to check the condition was to grow the mother plants in a mixed nursery between rows of broad-leaved species. Though infection experiments are not recorded the author suspects that *C. laricis* is the pathogenic agent rather than the *Phomopsis*.

During the spring of 1939, planes [*Platanus*] were severely attacked

by *Gnomonia veneta* [ibid., xii, p. 735; xviii, p. 827]. Cultural studies [which are described in detail] with conidia of the imperfect stage (*Gloeosporium nervisequum*) from the leaves, and spores of *Discula platani* [ibid., xviii, p. 213] and *Fusicoccum veronense* from the branches showed that all belonged to the first-named, with which *G. platani*, *G. valsoideum*, *Sporonema platani*, and *Cytosporella platani* are regarded as identical. The branch-inhabiting form of the disease is considered much the more dangerous. The most important control measure lies in the prompt removal of the first branches that become infected, especially in the nursery; if infection is more advanced, all the large branches should be cut off and burned, and the wounds disinfected.

Shear (C. L.) & Davidson (R. W.). **A new species of Dothiora on Aspen and Willow.**—*Mycologia*, xxxii, 1, pp. 105–111, 3 figs., 1940.

A description [with a Latin diagnosis] is given of a new species, *Dothiora polyspora*, found on branches of willows [*Salix*] and aspens in Colorado. The presence of the fungus on dead tips of living twigs of aspen and willow and on stem cankers of young aspen suggests weak parasitism, but no inoculation experiments were attempted. In mono-ascospore cultures on agar media the fungus resembled a species of *Dematium*, but inoculations of sterilized willow twigs yielded a pycnidial stage similar to *Dothichiza*.

Servazzi (O.). **Contributi alla patologia dei Pioppi. VII. Su alcuni micromiceti pioppicoli.** [Contributions to the pathology of Poplars. VII. On some Poplar-inhabiting micromycetes.]—*Boll. Lab. sper. R. Oss. Fitopat., Torino*, xvi, 1–4, pp. 86–96, 1 pl., 1939 (issued 1940).

Continuing his investigations into poplar diseases [*R.A.M.*, xviii, p. 639] the author gives an annotated list of 25 fungi, mostly common saprophytes, found on this host in Italy.

Hahn (G. G.). **Distribution and hosts of Cedar blight in the United States. Reports of Cedar blight in 1939.**—*Plant Dis. Reptr*, xxiv, 3, pp. 52–58, 1 map, 1940. [Mimeographed.]

Red cedar (*Juniperus virginiana*) blight (*Phomopsis juniperovora*) [*R.A.M.*, xix, p. 328] is now known to occur in 25 States of the American Union, as well as in the District of Columbia. New hosts of the fungus [ibid., x, p. 83] include *J. japonica*, *J. chinensis* var. *mas*, *J. horizontalis* var. *douglasii*, and *J. ashei*, while *J. virginiana* var. *pyramidiformis hillii* (the Dundee or Hill Dundee juniper) has given evidence of resistance in recent tests. During 1939 the blight was destructive in Minnesota and Wisconsin, but of recent years, according to a written communication from E. Wright, of the Nebraska Division of Forest Pathology, it has been of little importance in the western States, Nebraska, Kansas, Oklahoma, and Texas, the succession of dry seasons possibly contributing to the lack of serious infection in Nebraska and Kansas where the fungus was previously virulent.

HEIMBURGER (C.) & MCCALLUM (A. W.). **Balsam Fir butt rot in relation to some site factors.**—*Pulp Pap. (Mag.) Can.*, xli, 4, pp. 301–303, 1940.

The frequency and intensity of butt rot in balsam firs (*Abies balsamea*) caused by *Poria subacida* (feather rot) and *Polyporus balsameus* (brown rot) [*R.A.M.*, viii, p. 412] and in white and black spruce [*Picea glauca* and *P. marina*] (*Poria subacida, Polyporus balsameus, P. schweinitzii, P. circinatus* [ibid., ix, pp. 148, 628], or *Fomes pini*) were studied in two site types in the Boreal Region of Quebec, namely, softwood flats (*Cornus* ground vegetation) and mixed wood slopes (*Aster*), and found to be heavier in the latter. Thus, *P. balsameus* was found on *Abies balsamea* in 42 per cent. of the *Cornus* and in 61·4 per cent. of the *Aster* plots. The various black spruce rots occurred on 88·4 per cent. of the *Cornus* and 70·7 per cent. of the *Aster* plots, but *Poria subacida* is less widely distributed on the latter, though more severe. In white spruce the rots were observed on 27·4 per cent. of the *Cornus* and on 34·6 per cent. of the *Aster* plots. Butt rot is a much greater problem in a dry than in a cool, moist climate, where the balsam fir flourishes.

BUCHANAN (T. S.). **Fungi causing decay in wind-thrown northwest conifers.**—*J. For.*, xxxviii, 3, pp. 276–281, 1940.

During one or more of the years 1926, 1929, and 1936, examinations were made of Douglas fir (*Pseudotsuga taxifolia*), Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), and silver fir (*Abies amabilis*), blown down on the Olympic Peninsula of Washington in 1921. Of the 21 wood-destroying fungi of which sporophores were found on the various trees, 17 caused appreciable decay. Generally speaking, the sporophores of the different fungi were formed with equal facility on all the trees except *T. plicata*, the only important damage to which was caused by *Polyporus cuneatus* [*R.A.M.*, xix, p. 315]. *Fomes applanatus* [*Ganoderma applanatum*] was the most active pathogen of Douglas fir, *Tsuga heterophylla*, and *A. amabilis*, while *Picea sitchensis* suffered chiefly from *F. pinicola*. At the last inspection *F. pinicola* and *G. applanatum* were present in over 85 per cent. of the decayed volume of *P. sitchensis* and Douglas fir, respectively. Other fungi represented in the material included *Armillaria mellea* on *P. sitchensis*, Douglas fir, and *T. heterophylla*, *F. annosus* on the same and *Abies amabilis*, *F. putearius* and *F. roseus* on Douglas fir, *G. oregonense* [loc. cit.], *Lenzites sepiaria*, and *Polyporus* [*Polystictus*] *abietinus* on all except *Thuja plicata*, *Polyporus fibrillosus* on *Picea sitchensis*, Douglas fir, and *Tsuga heterophylla* (trace), *P. sulphureus* on Douglas fir, and *P.* [*Polystictus*] *versicolor* on all.

DAVIS (W. C.), YOUNG (G. Y.), & ORR (L. W.). **Needle droop of Pine.**—*J. For.*, xxxvii, 11, pp. 884–887, 1 fig., 1939.

Needle droop of red pine (*Pinus resinosa*) was first observed in the Lake States of Minnesota, Wisconsin, and Michigan in 1935, and also occurred in Maryland in 1936 and in Massachusetts in 1937. Considerable damage was caused by the premature loss of most of the affected needles, which bent over more or less sharply about $\frac{1}{4}$ in. from the base;

those remaining alive usually showed lesions accompanied by resin deposits at the point of constriction, and did not regain their normal erect position. In the Chippewa National Forest about 80 per cent. of the trees were injured over an area of 200 acres, all sizes up to 20 ft. in height being involved, though the symptoms were most severe in those under 6 ft. On the Red Lake Indian Reservation 50 to 60 per cent. of the trees were attacked and 40 per cent. killed by the disorder, which is tentatively attributed, in the absence of insects or other micro-organisms, to abnormal physiological factors, such as might be associated, for instance, with the temporary drought following exceptionally rapid growth in the wet early summer of 1915. Droop symptoms were induced on 5 out of 14 three-year-old red pine seedlings in a greenhouse at 90° to 100° F. by withholding water for 20 days and then resuming normal watering.

BARRETT (J.). **Timber salvage from Douglas Fir trees infected with conk rot (Trametes pini).**—*J. For.*, xxxvii, 7, pp. 577–578, 1939.

The results of a study made in the Pacific North-west to determine the profitability of timber salvage from Douglas firs [*Pseudotsuga taxifolia*] infected by conk rot (*Trametes* [or *Fomes*] *pini*) [*R.A.M.*, xviii, p. 644] indicated that heavily infected trees, i.e., those on which conks appear within 20 or 30 ft. from the ground and continue upwards to the top, should not be cut, but that good footage may be expected from cases of milder attack. Of the 1,057,376 ft. cut in the course of these investigations, 386,112 ft. (38 per cent.) was infected by *F. pini* and 203,848 ft. (53 per cent. of the infected) rejected as worthless for the purpose in view.

HUBERT (E. E.). **A method of substituting Pine sapwood for malt agar in culturing test fungi.**—*Science*, N.S., xci, 2358, pp. 247–248, 1 fig., 1940.

Ponderosa pine [*Pinus ponderosa*] sapwood was successfully substituted for malt agar in culturing wood-rotting and sap-staining fungi used in testing the toxicity of wood preservatives. The method is described as follows: inside a half-gallon, square, wide-mouthed, screw-capped Kerr jar laid on its side, two pieces of sapwood, $\frac{1}{4}$ by $2\frac{3}{4}$ by $6\frac{1}{8}$ in., are placed on a grooved strip of sapwood in such a manner as to form a V-shaped trough, at the bottom of which a glass tube is placed. About 100 c.c. water is added and a pad of cotton wool placed in the cap, which is loosely screwed down. After sterilizing the jar and contents the fungus inoculum is deposited at various points on the two boards and when the required growth has been obtained moistened pine test pieces, $\frac{1}{4}$ by $1\frac{1}{2}$ by 2 in. (8 to 10 at a time) are placed over the fungus mat, their lower edges resting on the glass tube. This method is stated to provide a much greater capacity for test pieces than the Kolle flask and to be more economical in time and cost.

ZYCHA (H.). **Einfluß von Nährsalzen auf den Holzabbau durch Pilze.** [The influence of nutrient salts on the fungal disintegration of wood.]—*Holz Roh- u. Werkstoff*, iii, 2, pp. 50–52, 2 figs., 1940.

Laboratory experiments were carried out at the Hann.-Münden

Institute of Forest Botany to determine the influence of nitrogenous salts on the disintegration of spruce wood (used for indoor constructional purposes) by *Coniophora cerebella* [*C. puteana*] and *Paxillus acheruntius* [*P. panuoides*: *R.A.M.*, xviii, p. 426], pure cultures of which were inoculated into wooden sticks semi-embedded in dry clay (commonly used as a filler in ceilings) in flasks moistened with varying quantitites of three nitrogenous salts in 25 c.c. water. After three to four months the losses (in percentages of the initial weight of the kiln-dried wood) were as follows: (1) *C. puteana*: control 22, calcium nitrate 0·47, 1·09, and 3·59 gm. per kg., 22, 22, and 22, respectively; potassium nitrate 0·16 and 0·47 gm., 26 and 30, respectively; ammonium sulphate 0·78 and 1·56 gm., 50 and 54, respectively. (2) *P. panuoides* (quantities of salts as for *C. puteana*): control 16; calcium nitrate 35, 48, and 7, respectively; potassium nitrate 32 and 43, respectively; ammonium sulphate 47 and 33, respectively.

It is concluded from these data that clay (which in itself exerts no deleterious influence on the durability of wood) may safely be used as a filler if taken from a suitable source—preferably from uncultivated soils or from the subsoils of cultivated ground, which have total nitrogen contents of only 0·2 and 0·6 gm. per kg., respectively, as compared with 1·2 for the upper layers of soil in cultivation. Sand or slack may also be used with advantage.

LEHTINEN (E.). **Timmerbevattningsmetoden.** [The timber spraying method.]—*Papp. Trävarutidskr. Finl.*, xxi, 23–24, pp. 816–818, 820, 7 figs., 1939.

This is an account of the Runbäck method of spraying wood (floating or dry) for the prevention of blueing [*Phialophora fastigiata* and *Pullularia pullulans*: *R.A.M.*, xvi, p. 575; xviii, p. 774], which is stated to be almost universally applied in the timber industry throughout Sweden.

Chronique forestière. Poteaux télégraphiques. Pour augmenter la durabilité des poteaux télégraphiques et téléphoniques. [Forestry notes. Telegraph poles. To increase the durability of telegraph and telephone poles.]—*Bull. Soc. for. Belg.*, xlvii, pp. 142–144, 1940.

In the first of these notes it is stated that taking an average of 18 European countries the proportions of the different timbers used for telegraph poles are 76 per cent. Scots pine [*Pinus sylvestris*], 18 per cent. fir, and 2 per cent. each for larch, oak, and chestnut. Of the preservatives used, coal tar oil, mercuric chloride, copper sulphate, U salts (UA basilite, U thanalith) [*R.A.M.*, xix, p. 249], and 'various' were applied, respectively, to 67, 11·8, 15·9, 3·1, and 0·2 of the trees, and gave, respectively, 26, 18, 21, 12, and 12 years' protection from decay. Untreated trees numbered 2 per cent., and lasted 9·5 years.

The second note is an abstract in popular terms of a paper already noticed [ibid., xix, p. 181].

VAN WYK (J. H.) & LOSEBY (P. J. A.). **The preservation of wood.**—*J. S. Afr. For. Ass., 1939*, 2, pp. 11–30, 3 pl., 2 diags., 1939.

This is a useful survey of the practical, technical, and economic aspects of timber preservation in South Africa [*R.A.M.*, xvi, pp. 788,

789], where the following preparations have been found most suitable: creosote (used at a minimum absorption of 5 lb. ($\frac{1}{2}$ gall.) per cu. ft. for *Eucalyptus* spp. and at a somewhat heavier rate for pine wood); fuel oil, the chief value of which is as a diluent for creosote or other preservatives, its only independent property being a waterproofing action tending to keep the wood below the moisture content required for fungal development; zinc chloride (in solutions up to 5 per cent., used at a minimum rate of $\frac{1}{2}$ lb. dry salt per cu. ft.); a mixture of 1 per cent. arsenious oxide and 3 per cent. zinc chloride; and zinc sulphate, largely employed for the treatment of mine timber in the Witwatersrand area, where the salt is obtained as a cheap by-product of the gold extraction process. Full directions are given for the application of both the superficial and impregnating processes, the former comprising brush treatment, dipping, and spraying, and the latter pressure, non-pressure, steeping, open-tank, and farmers' plants. Lists are given of durable and non-durable, indigenous and exotic woods. The average life of an untreated pole is about three years compared with approximately 20 years for one treated with creosote.

[An Afrikaans version of this paper appears in *J. S. Afr. For. Ass.*, *1939*, 3, pp. 82–99, 3 pl., 3 diags., 1939.]

BIRKINSHAW (J. H.) & FINDLAY (W. P. K.). **Biochemistry of the wood-rotting fungi. Metabolic products of Lentinus lepideus Fr.**—*Biochem. J.*, xxxiv, 1, pp. 82–88, 1940.

This is a detailed account of the technique and results of the authors' studies on the metabolic products of *Lentinus lepideus* from Scots pine [*Pinus sylvestris*], the outcome of which has already been noticed from another source [*R.A.M.*, xix, p. 377].

ERDMANN (W.). **Holzschutz gegen Fäulnis in Gebäuden.** [Timber protection against decay in buildings.]—*Z. Ver. dtsch. Ing.*, lxxxiii, 22, pp. 685–687, 7 diags., 1939.

This paper summarizes the constructional precautions and chemical treatments to be employed in Germany against the very prevalent domestic wood-destroying fungi, *Coniophora cerebella* [*C. puteana*], *Merulius lacrymans*, and *Polyporus vaporarius* [*Poria vaporaria*, to which *P. vaillantii* is commonly referred: *R.A.M.*, xviii, p. 76].

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiv, 3, pp. 58, 60, 1940.

JAMAICA. Law No. 21 of 19th June, 1939, to be cited as the Banana (Leaf Spot Control) Law 1939, provides assistance for the treatment of bananas against *Cercospora musae*.

RÉUNION. The importation into Réunion and the circulation, warehousing, and transit in the island of cassava plants, cuttings, and seeds from whatever country is prohibited (as a safeguard against mosaic) by a Decree of the Minister for the Colonies dated 5th February, 1940. Exceptions may be granted in special cases only, and provided that the plants are accompanied by an official health certificate from the country of origin. Each lot admitted will be grown in quarantine for 15 months, and its subsequent cultivation controlled.

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NUGENT (T. J.). **Some notes on black rot of Kale in Virginia.**—*Plant Dis. Reptr*, xxiv, 4, pp. 84–85, 1940. [Mimeographed.]

Even in stands of kale raised from seed from which the black rot organism (*Phytomonas* [*Pseudomonas*] *campestris*) was eliminated by 20 minutes' immersion in 1 in 1,000 mercuric chloride [*R.A.M.*, xviii, p. 565], infection developed in varying amounts in recent experiments at the Norfolk (Virginia) Truck Experiment Station, denoting the existence of additional sources of inoculum, possibly in the soil or agricultural implements.

CABRAL (R. V. DE G.). **Gloeosporium concentricum (Grev.) Berk. et Br. na Brassica oleracea L.** [*Gloeosporium concentricum* (Grev.) Berk. & Br. on *Brassica oleracea* L.]—*Broteria*, ix, 1, pp. 18–41, 2 pl., 2 figs., 1940. [English summary.]

This is a comprehensive, tabulated account of the writer's studies in Lisbon on the cauliflower disease caused by *Gloeosporium concentricum* [*R.A.M.*, xix, p. 118] previously reported from Portugal by Moniz da Maia in *Rev. agron., Lisboa*, i, 3, 1918–20. The optimum temperature for the growth of the fungus was found to be between 18° and 20° C., at and below which on favourable media, such as Dox's agar, masses of moist, creamy spores, 6 to 14 by 2 to 4·5 (average 10·3 by 2·9) μ, are produced. At 22° to 25° the fungus forms spherical, black bodies, 140 to 270 μ in diameter, approximating closely to sclerotia, or rudimentary pycnidia or perithecia. Inoculation experiments on cabbages in the greenhouse and field with aqueous spore suspensions gave positive results, the normal incubation period ranging from 13 to 15 days. The high temperatures prevailing during May and June acted adversely on the development of the pathogen, thereby supporting the results of laboratory tests. Under natural conditions the disease affects cauliflowers in Portugal from March to May, but generally causes inconsiderable damage; the most conspicuous symptom of infection is the appearance on the leaves of the minute, snow-white acervuli of the fungus [an emended Latin diagnosis of which is given].

WALKER (J. C.). **Resistance to clubroot in varieties of Turnip and Rutabaga.**—*J. agric. Res.*, lix, 11, pp. 815–827, 1939.

In trials conducted with turnip and rutabaga (swede) varieties in Wisconsin soils [*R.A.M.*, xv, p. 547], turnips showed a wide range of resistance and susceptibility to *Plasmodiophora brassicae*, while most

of the swede varieties were highly resistant and none of the susceptible ones showed a high percentage of infection. These results agree, as regards turnips, with those obtained elsewhere [ibid., xvi, p. 223; xviii, p. 776], while the high resistance observed in swedes in Wisconsin, but not elsewhere, seems to indicate a possible variation in pathogenic selectivity within the species *P. brassicae*. A limited study of inocula from various widely separated parts of the United States showed on the whole little difference in their pathogenicity, although with some inocula low percentages of infection were obtained on the Snowball turnip and American Purple Top swede that had shown complete resistance to the Wisconsin inoculum.

NEUGEBAUER (E. A.). **Die Rübenblattfleckenkrankheit im Jahre 1939.** [The Beet leaf spot disease in the year 1939.]—*Dtsch. Zuckerindustr.*, lxv, 10, pp. 190–191, 1940.

High atmospheric humidity, coupled with temperatures round about 20° C., is a prerequisite condition for the rapid propagation of *Cercospora beticola* which was fulfilled in (Prussian) Silesia in 1939, when the precipitation in the district west and south of Breslau from 1st May to 30th September amounted to over 600 mm. Very satisfactory results in the control of the disease were obtained by spraying with 1 per cent. kupferkalk-Bayer-neu at the beginning of July, August, and September [cf. *R.A.M.*, xviii, p. 721]. The operations were facilitated by the use of a charlock spraying apparatus, by means of which it was possible to cover 5 hect. per diem instead of only one with a hand-sprayer; further improvements along the lines of the motor potato-sprayer, covering 10 hect. daily, are desirable. The loss of foliage among the treated plants was barely 20 per cent. compared with over 60 for the controls. The cost of the spray is estimated at Rm. 2 (400 l.) per hect.

REINKING (O. A.). **Incidence of disease in common-Bean-mosaic resistant and non-resistant Green Refugee Beans in New York, season of 1939.**—*Plant Dis. Reptr*, xxiv, 2, pp. 37–40, 1940. [Mimeographed.]

Field tests in New York in 1939 demonstrated that Idaho Refugee and U.S. 5 beans which are resistant to common bean mosaic [*R.A.M.*, xviii, p. 430] clearly out-yielded the non-resistant Stringless Green Refugee bean, especially where the last-named was severely affected. Also, U.S. 5 gave rather larger yields than Idaho Refugee. Both the resistant varieties in commercial field plantings remained unaffected, while Stringless Green Refugee developed nearly 100 per cent. infection in all fields. All three types were equally affected by yellow mosaic [ibid., xv, p. 418].

One-sided variegation, identical with Zaumeyer's heritable abnormality resembling mosaic [ibid., xviii, p. 7], was confined (in these experiments) to the hybrid Idaho Refugee bean and one of its parents, the non-commercial Corbett Refugee bean. It is, apparently, being selected out of new strains, and is not present in a severe form in commercial strains of U.S. 5 or the Stringless Green Refugee.

The evidence indicated that Idaho Refugee and U.S. 5 are more susceptible to *Phytomonas* [*Bacterium*] *phaseoli* and *P.* [*Bact.*] *medicaginis phaseolicola* [ibid., xviii, p. 366] than is Stringless Green Refugee.

Goss (R. W.). **The relation of temperature to common and halo blight of Beans.**—*Phytopathology*, xxx, 3, pp. 258–264, 1 fig., 1940.

In greenhouse trials under controlled conditions at the Nebraska Agricultural Experiment Station common blight of beans (*Phaseolus vulgaris*), caused by *Phytomonas* [*Bacterium*] *phaseoli*, was induced by inoculation on the susceptible Red Kidney variety at all temperatures tested between 16° and 32° C., the appearance of the symptoms, however, being greatly retarded at the lower end of the scale; the incubation periods at 16°, 20°, and 32° were 27, 23, and 7 days, respectively. The transference of plants from low to high temperatures resulted in the rapid development of symptoms on apparently healthy foliage, but the amount of diseased leaf tissue was greatest on the plants maintained constantly at the higher temperatures. The oldest leaves of the young plants tested proved more susceptible than the ones unfurling at the time of inoculation.

Halo blight (*P.* [*Bact.*] *medicaginis* var. *phaseolicola*) followed inoculation at all temperatures tested between 12° and 32°, the halo being most prominent at 20° and below and absent at 28° and 32°, where it was replaced by an abundance of small, inconspicuous spots, accompanied by bacterial exudate on the under leaf surfaces. The youngest leaves were the most susceptible to infection. Halo blight, unlike the common form of the disease, caused little damage to the primary leaves.

The relative humidity after a 24-hour incubation period at high humidity did not affect the virulence of halo blight, but a low atmospheric moisture content accentuated the severity of the symptoms on foliage suffering from common blight.

Person (L. H.). **Further studies on control of soil rot of Sweet Potatoes.**—*Proc. Ass. Sth. agric. Wkrs*, xl, pp. 179–180, 1939. [Abs. in *Chem. Abstr.*, xxxiv, 8, pp. 2525, 1940.]

Applications of sulphur at the rate of 600 to 800 lb. per acre [? in Louisiana] lowered the P_H value of the soil from between 5·8 and 6 to between 4·8 and 5, and permitted the normal growth of sweet potatoes, which in the absence of this treatment remained stunted, developed chlorosis, and were killed in large numbers by soil rot [*Actinomyces* sp.: *R.A.M.*, viii, p. 598; xi, p. 535]. Moreover, the sulphuring of heavily infected soils increased yields from practically nil to 75 to 115 crates of U.S. 1 and 2 grades.

Horsfall (J. G.) & McDonnell (A. D.). **Varietal susceptibility of Peppers to bacterial spot.**—*Plant Dis. Reptr*, xxiv, 2, pp. 34–36, 1940. [Mimeographed.]

In September, 1939, *Phytomonas vesicatoria* [*Bacterium vesicatorium*] developed in an epidemic form on a large variety and strain collection of peppers [*Capsicum annuum*: *R.A.M.*, xvi, p. 302] in Connecticut, appearing primarily on the foliage, and causing typical scabby spots and defoliation. The plants were divided according to degree of infection into the following categories: (1) unaffected, (2) with a few leaf spots, (3) severely spotted, slight defoliation, (4) up to 50 per cent. defoliation, and (5) over 50 per cent. defoliation. The average of all replicates gave an index of disease. The varieties were then grouped according to

whether the disease index fell between 1 and 2 (resistant), 2 and 3 (somewhat resistant), 3 and 4 (somewhat susceptible), or 4 and 5 (susceptible).

Group 1 was found to include all ten strains of Waltham Beauty under observation, two of yellow Oshkosh (from which Waltham Beauty was selected), a cross between Waltham Beauty and the susceptible Pimiento (three strains), Sunnybrook 833, a Sunnybrook selection, and Sunnybrook Crosses. All of three strains of Squash were resistant, as were a few strains of Wonder. Harris Earliest and Harris Early Giant appeared to be resistant when coming from one source, but only fairly resistant when coming from another. Bullnose was resistant. Group 2–3 included all strains of Windsor A and B, most of the strains and selections of California Wonder, two strains of Asgrow King, Improved World Beater, and all strains of Improved Colossal. Group 3–4 included most of the Giant strains, the rest of the California Wonder and most of the Ruby King strains, a few strains of King of the North, Special Cheese, and Neapolitan. Most of the strains of World Beater and King of the North, Pimiento, Rocky Ford, Colossal, Cornelli's Special, Talionelli, Sweet Mountain, and Prolific Sweet were very susceptible.

It would appear that resistance is probably inherited as a dominant. Resistant Waltham Beauty crossed with susceptible Pimiento gives resistant progeny. Resistant Sunnybrook gives resistant progeny when crossed with Harris Early Giant, Cay, or Sweet Cheese. Resistant Harris Early Giant crossed with susceptible California Wonder gives resistant progeny.

HEMMI (T.). **Studies on septorioses of plants. VI. Septoria glycines Hemmi causing the brown spot disease of Soy Bean.**—*Mem. Coll. Agric. Kyoto*, 47, pp. 1–14, 1 pl., 1940.

Brown spot disease of soy-beans (*Septoria glycines*) [*R.A.M.*, vi, p. 74; xix, p. 256] is stated to be very prevalent on the leaves of plants cultivated along the raised footpaths between the rice fields near Kyoto, Japan, though less destructive in the locality under observation than in the north of the country. The first symptoms of infection in the early summer are brown or pale reddish-brown, slightly raised, angular, sharply defined spots, gradually turning dark to blackish-brown, on both leaf surfaces. The diseased foliage is prematurely shed from the base upwards.

The fungus readily produced pycnidia and pycnospores on potato decoction agar plus sucrose. The globose or subglobose, thin-walled, brown, ostiolate pycnidia measure 44 to 125 μ in diameter, and the filiform, hyaline, mostly irregularly curved, rarely guttulate, uni- to quadricellular spores 16·6 to 52·5 by 1·3 to 2·1 μ on the leaves and 22·4 to 48 by 1·3 to 2·1 μ in culture. The pycnospores germinate by means of one or two germ-tubes in 24 to 50 hours in water or on a nutrient medium, the swollen cells sometimes separating and developing within 48 hours into secondary conidia. The minimum, optimum, and maximum temperatures for the growth of the fungus on various standard media were found to be 5°, 24° to 28°, and 36°, respectively. Pycnospore formation was not affected by light or darkness, but tended to proceed more rapidly under the influence of fluctuating temperatures.

Inoculation experiments with spore suspensions of *S. glycines* from agar cultures on the leaves of young soy-bean plants maintained at 24° to 25° for 24 hours in moist chambers and then transferred to a greenhouse gave positive results after an incubation period of 10 to 14 days. The fungus was further shown to be capable of inducing fresh outbreaks of leaf spot by means both of seed- and soil-borne infection.

LIU (K.). **Studies on a Fusarium disease of Soy Bean pods.**—*Mem. Coll. Agric. Kyoto*, 47, pp. 15–29, 2 pl., 1940.

Pure cultures of the agent of a destructive pod blight of soy-beans [cf. *R.A.M.*, xi, p. 88] interplanted with rice in the Kyoto district of Japan, were compared with similar material of *Gibberella saubinetii* (suggested as the cause of the disease by Hara and Miura) and *G. fujikuroi* (responsible for the 'bakanae' disease of rice) and found to be distinct. Morphologically the fungus is identical with *Fusarium bulbigenum* var. *tracheiphilum*. Under natural conditions in the locality under observation the pathogen is confined to the pods, on which it produces brownish lesions, gradually enlarging to involve almost half or more of the surface. In advanced stages the pods bear flesh- or salmon-coloured sporodochia of the fungus. Pods infected when young generally shrivel and dry without forming seeds, whereas on older ones the lesions are limited by a brownish line and permit partial development of seeds which are sometimes attacked by the fungus. In moist chamber and greenhouse inoculation experiments with conidial suspensions the unwounded pods and stems became affected, though the latter remained healthy for a long time. The infection of the stems is of some interest in view of the occurrence of the fungus on soy-bean roots and stems in the United States [ibid., xix, p. 256].

Conidial germination and germ-tube growth tended to decrease under the influence of daylight. Germination took place readily in drops of conidial suspension but after the drops were dried it was very considerably reduced in an atmosphere of 100 per cent. humidity and did not take place at all at 99 per cent. The optimum temperature for the process appears to lie at about 24° C., within the range 16° to 36°.

MILLER (L. I.). **Control of leafspot of Peanuts in Virginia—1939.**—*Plant Dis. Reptr*, xxiv, 3, pp. 63–64, 1940. [Mimeographed.]

In field experiments in Virginia in 1939 the best control of leaf spot of groundnuts (*Cercospora*) [? *arachidicola* and *C. personata*: *R.A.M.*, xviii, p. 433; xix, p. 62] was given by four to five fortnightly applications of sulphur dust beginning on 1st or 15th July, the average number of spotted leaflets being 43 per cent. as against 86 in the untreated control plots, the corresponding figures for three to four treatments commencing 15th July and 1st August and for three applications starting 15th August being 55, 60, and 73 per cent., respectively. The average net profit from the increased yields in the dusted plots was \$18·00 per acre.

LYKIARDOPOULO (T. L.). **À propos du court-noué.** [On court-noué.]—*Progr. agric. vitic.*, cxiii, 1, pp. 12–13, 1940.

The author states that he has observed court-noué disease of the

vine in localities in Greece in which *Phylloxera* [*vastatrix* f. *radicicola*] is not known to be present [*R.A.M.*, xix, p. 67]; he has also noted the disease on ungrafted *Vitis vinifera* vines. In Greece, court-noué usually appears in low-lying, damp localities, most often in argillaceous-calcareous soils. Locally, vines are planted so closely that the roots meet, and the condition spreads from an affected vine to that nearest to it. When an affected vine is removed and a healthy vine at once planted on the same site, the latter becomes affected within two or three years.

Du Plessis (S. J.). **Anthracnose of the Vine.**—*Fmg S. Afr.*, xv, 168, pp. 97–100, 104, 6 figs., 1940.

Anthracnose [*Elsinoe ampelina*: *R.A.M.*, xvii, p. 221; xviii, p. 502; xix, p. 366] is stated to be one of the oldest vine diseases found in the winter-rainfall area of Cape Province, South Africa, where several vineyards, mostly of the Sultana variety, in the districts of Robertson and Swellendam have been uprooted owing to its ravages.

Rains are highly conducive to attack. A moist period is a primary requisite for spore formation on the affected surfaces, and if it continues for some time the liberated spores may spread to susceptible parts of the vine. The evidence showed that a semi-epidemic outbreak may follow two short successive rains of even less than $\frac{1}{2}$ in. each. As the young growth is very susceptible, irrigation largely increases the proportion of susceptible parts. Some varieties, e.g., Sultana, Henab Turki, and Waltham Cross, are highly susceptible, and in most areas need regular treatment; Barlinka and Cabernet are more resistant, and show marked symptoms only in seasons unusually favourable to infection, while Gros Colman, Raisin Blanc, and Steen are seldom if ever attacked.

The experimental evidence obtained demonstrated that excellent control is obtainable by spraying with sulphuric acid (4 per cent.), lime-sulphur (1 in 8), or copper sulphate (1 lb. to 2 gals. water) towards the end of winter, when the buds are well swollen. Weaker solutions of copper sulphate were ineffective, but lime-sulphur, even at 1 in 20, gave very satisfactory results. Winter spraying with copper sulphate gave marked increase in yield, representative figures being 6, 12, and 15 lb. of grapes per vine for no treatment, lime-sulphur (1 in 8), and copper sulphate (1 lb. in 2 gals.), respectively.

The data also showed that winter spraying is the most important form of treatment, and that coverage must be thorough. Infected material should be removed and destroyed at pruning. Debarking is not necessary, but weed removal facilitates treatment. A summer treatment is recommended in addition, except when infection is very slight; spraying with copper sulphate in winter, followed by dusting with verderame in summer, gave 99·9 per cent. control in severely infected vineyards. In general, three treatments should be made, (*a*) when the shoots are about 6 in. long, (*b*) when the flower caps have fallen, and (*c*) about three weeks later. The actual time of application largely depends on the rainfall experienced. Fungicides found to be more or less equally effective as summer treatments included copper sulphate dust, verderame (spray or dust), verderame sulphur dust (80–20), Bordeaux mixture (4–4–50), perenox (cuprous oxide) spray or

dust, and a basic preparation of copper sulphate (spray or dust). Adequate applications of pure sulphur were almost as good as pure copper carbonate with clay, and both fungicides were better pure than mixed. As most farmers regularly treat the vines with sulphur against *Oidium* [*Uncinula necator*] it would probably be found cheaper to use sulphur also for anthracnose.

Combating mould in Grapes.—*Fruit World, Melbourne*, xli, 3, p. 4, 1940.

It is stated that it is a common practice in California to fumigate trucks of grapes with sulphur dioxide to retard the development of moulds [unspecified] in transit [*R.A.M.*, xix, p. 287]. Treatment in most cases affords protection for two or three weeks. If grapes intended for longer storage cannot be refumigated, sodium bisulphite, which releases sulphur dioxide, is added to the package, the technical grades of powdered sodium bisulphite and sodium metabisulphite having been found suitable. In lug packs the chemical is sifted into the pad on which the grapes are packed. Only 5 gm. of sodium bisulphite should be added to the package, and the powder should be evenly distributed through the sawdust or pad, and should not come into direct contact with the fruit; sodium bisulphite should not be used if the fruit or sawdust is wet.

SERVIÈRE (H.). **Chronique. Organisation de la défense contre les attaques du mildiou.** [Current notes. The organization of defence against mildew attacks.]—*Progr. agric. vitic.*, cxiii, 10, pp. 197–199, 1940.

To avoid unnecessary use of copper sulphate in the control of vine mildew [*Plasmopara viticola*] the author recommends the suppression of the primary foci of infection in damp places, which favour the germination of soil-borne winter spores, by removing the buds and the leaves at the base of low stocks and grafts before any signs of the disease appear. The practice should be carried out even in abandoned vineyards, and growers should collaborate in this part of the work.

VIVET (E.). **Échelonnement des traitements contre le mildiou.** [The intervals between mildew treatments.]—*Rev. Vitic., Paris*, xcii, 2389, pp. 176–177, 1940.

In discussing the frequency with which spray treatments against vine mildew [*Plasmopara viticola*] should be applied in Algeria [cf. *R.A.M.*, ii, p. 104], the author states that under the conditions prevailing locally initial leaf infection arising from winter spores is generally very slight, only very few of these organs being produced in autumn, even on the most susceptible varieties. Locally, the first leaf lesions appear, in five years out of six, during the first fortnight in May, though in some years they may develop much earlier (29th March in 1936 and at the end of April in 1939). In the coastal regions the first spray application should be made as soon as the shoots are 6 to 8 cm. long. This should be followed by another a week later. In wet places a supplementary application is advised in order to delay initial infection as much as possible, and to obviate the development of leaf-spotting during the fortnight preceding flowering. Observations by P. Aldebert

in 1939 demonstrated that the period elapsing between contamination and the appearance of the fructifications may be as short as four days, and under such conditions the vines should be sprayed twice in the same week.

A year's progress in solving farm problems of Illinois.—*Rep. Ill. agric. Exp. Sta., 1936–37*, 351 pp., 32 figs., 35 graphs, 5 maps, 1939. [Received April, 1940.]

In this report [cf. *R.A.M.*, xvii, p. 379] B. Koehler states that resistance in maize to ear rots (*Diplodia* [*zeae* and *D. macrospora*], *Fusarium* spp., *Gibberella* [*saubinetii*] and *Nigrospora* sp.) [ibid., xvi, p. 169] is not inherited as a unit. In breeding for ear rot resistance, each rot must be taken separately. With Station Yellow Dent maize as a standard of comparison, Illinois Hybrid 172 showed resistance to all four rots, and outstanding resistance to *Diplodia* and *Fusarium* rot, which usually cause the most damage; other hybrids were resistant to certain rots. Evidence showed that artificial lodging may be of use as a rapid test for determining resistance to ear rots.

E. E. De Turk, E. B. Earley, and J. R. Holbert working with two single crosses of yellow dent maize, one (R4 × Hy) highly resistant to low temperature injury and to stalk rot due to *D.* [*zeae* and *D. macrospora*], and the other (Lan × R313) susceptible to these conditions, found that the greater the percentage of total sugars the less the injury produced by either cause. The hybrid R4 × Hy averaged 29 per cent. more total sugar than Lan × R313 in the lower, middle, and upper parts of the stalk, and 8 per cent. more in the shank. In both hybrids, reducing the area of the leaves by 30 per cent. lowered the sugar content of the stalks and the resistance of the plants to both conditions. Stalk injury due to cold and rot was uniformly distributed over the plants, but tended to follow the reduced sugar concentrations.

Outbreaks of wheat mosaic [ibid., xviii, p. 661] occurred for the first time in seven more Illinois counties, in addition to the 17 counties in central and south-central parts of the state where extensive areas of soil are infected. In the seven new counties losses on different farms ranged up to 90 per cent. of the crop. Severe damage resulted from a combination of thorough soil infection, seasonal conditions favouring the disease, and the planting of highly susceptible varieties. In some varieties mosaic produces a high percentage of severely stunted plants which fail to head. In others, such as the high-yielding hard red wheats Brill and Cheyenne, the leaves are mottled and occasionally dwarfed, but the plants head out; in tests with these varieties, loss of yield amounted to 35·9 per cent. in the former and 47·4 per cent. in the latter. Almost all the hard red winter wheats grown in Illinois, including Turkey Red, were ascertained to be susceptible to considerable injury by mosaic, though Ibred seems to suffer less damage than others. Of the soft wheats, Fulcaster, Fulhio, Duffy, Nabob, and Wabash are mosaic resistant.

B. Koehler found further proof that ethylmercury phosphate (new improved ceresan) acts to some extent as a gas during dry storage of treated grain [ibid., xix, p. 142]. Within limits, the longer the storage period the less the amount of the disinfectant required to control cereal

smuts. With a storage period of a month or more the dosage should be reduced to $\frac{1}{4}$ oz. per bush. of grain, this treatment giving almost as good results as $\frac{1}{2}$ oz. applied a day before sowing.

Stationary spraying plants are becoming increasingly popular with fruit growers in Illinois, mainly because underground pipes permit spraying to be carried on when the ground is too wet to allow portable units to be used [ibid., xix, p. 295].

During a dry season Bordeaux mixture should not be used without oil in the first and second cover sprays on apple trees, as the transpiration induced is too rapid.

Strawberry 'brown stele' [ibid., xvii, p. 380; cf. also xix, p. 107] is favoured by soil with a high water-holding capacity. Crosses between the resistant Aberdeen and Mastodon varieties are being tested under field conditions.

Thirteenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1939.—110 pp., 8 figs., 1 map, [? 1939. Received June, 1940.]

Among the items of interest in this report [cf. *R.A.M.*, xviii, p. 656] the following may be mentioned. From tests on samples of the 1939 Tasmanian apple crop taken in January and February, and consideration of the seasonal climatic conditions, forecasts were made of the probable storage qualities of the chief commercial varieties. Such forecasts have been made with reasonable accuracy for several seasons; they provide a very useful guide for planning picking programmes and storage schedules to minimize wastage. In tests with Sturmer and French Crab apples stored in artificial atmospheres liability to brown heart [ibid., xvii, p. 463] and alcoholic poisoning [loc. cit.] increased with carbon dioxide concentration and fruit maturity, but decreased with temperature over the range 33° to 44° F.

When wheat was grown in soil with added excess of potassium salts and of ground magnesite, whiteheads [usually caused by *Ophiobolus graminis*: ibid., xviii, p. 733] developed, indicating that there may be some justification for the view that whiteheads in the field are sometimes due to physiological factors.

In northern Queensland the adoption by tobacco-growers of the methods recommended for the control of *Cercospora* [*nicotianae*: ibid., xvii, p. 376] has resulted in the disease being reduced from major to very minor importance. During the period under review the worst recorded outbreak of tobacco yellow dwarf [ibid., xvii, p. 75] occurred, many fields in Victoria being abandoned because of the disease. Tests of the insect transmission of yellow dwarf gave inconclusive results, but transmission to Solanaceous plants was effected by grafting. In seed-bed experiments against downy mildew [*Peronospora tabacina*: ibid., xix, p. 439] cuprous oxide spray and paradichlorbenzene in conjunction with cover treatments gave unsatisfactory results, but the use every night of an evaporation surface of benzol equal to one-hundredth of the seed-bed area, together with wetting of the seed-bed covers proved satisfactory, and is recommended.

During 1939, 70 per cent. of 89 *Pinus taeda* and *P. caribea* trees affected with needle fusion [ibid., xviii, p. 502] and treated with borax

showed reduction or absence of symptoms in the growth made during the season after treatment. The corresponding figures for 23 trees treated with superphosphate and 102 untreated controls were 26 and 16 per cent., respectively. In spite of the reduced severity of the symptoms in those trees that responded to borax, the treatment gave little increase in vegetative vigour. Grafting experiments indicated that certain individual trees may be genetically much more susceptible than others.

Preliminary tests of the rate of leaching and change in composition of creosote oil impregnated into wood immersed in sea water indicated a moderately rapid loss of the portions of the creosote distilling below 230° C., loss under sea water occurring at about the same rate as in moderate air conditions.

Further studies on the decay of jarrah [*Eucalyptus marginata*] in service indicated that under moist conditions *Coniophora cerebella* [*C. puteana*] is generally the cause. The fungus also causes extensive rotting in the living tree. A decay of jarrah and many other timbers characterized by abundant longitudinal penetration of the fibre walls, parallel to the long axes of the fibres, and either vertical or helical, was caused by a non-Basidiomycete. In further studies on *Fistulina hepatica* [ibid., xviii, p. 72] no evidence was obtained of typical rotting by this fungus in *E.* spp. The fungus associated with 'heart' in *E. regnans* has now been determined as a species of *Gonytrichum*, and not specifically as *G. caesium* [ibid., xviii, p. 656].

Experimental evidence indicated that a temperature of 50° F. is the most satisfactory one for storage of Washington Navel and Valencia late oranges susceptible to storage spot [ibid., xviii, p. 657], while mould [chiefly *Penicillium digitatum* and *P. italicum*] is best controlled by one of 37° to 40°. Mould wastage is generally greatest on fruit picked after heavy rain. Preliminary sweating at 70° to 90° reduced wastage from storage spot and mould, but the effect varied from year to year, from grove to grove, and with maturity and the conditions obtaining before picking. In one lot of oranges there was a critical moisture loss of 3 to 4 per cent., beyond which increased water loss led to greater wastage. In Valencia late oranges, wastage from *Penicillium* infection and storage spot was reduced by treatment with a wax emulsion and the use of diphenyl wraps. Borax treatment of Washington Navel oranges reduced mould wastage but increased storage spot. After seven weeks' storage at 37°, 40°, and 45°, Emperor Mandarin oranges from two groves showed least and most wastage at 40° and 45°, respectively, wastage being also decreased by preliminary washing with 1 per cent. caustic soda or 8 per cent. borax. With clipped fruit, borax gave better results than soda, while with pulled fruit the reverse obtained.

When Waltham Cross and Ohanez grapes packed in cork treated with iodine, sulphur, iodoform, diphenyl, and o-phenylphenol were stored [cf. ibid., xix, p. 287] the most promising results in the control of mould [unspecified] were given by iodine, though it slightly tainted the fruit.

SIMMONDS (J. H.). **Report of the Plant Pathological Section.**—Ex *Rep. Dep. Agric. Qd, 1938-9*, pp. 25–28, 1939.

The following items of interest occur in this report on plant disease work in Queensland [cf. *R.A.M.*, xviii, p. 502]. Locally, the severity

of wheat flag smut [*Urocystis tritici*: ibid., xix, p. 397] appears to be closely bound up with weather conditions, in some seasons scarcely any infection being present anywhere in the wheat belt.

A survey of lucerne diseases in South Queensland showed that the chief troubles are witches' broom and root rots. The former is due to a virus [ibid., xiv, p. 516], and is fairly generally distributed; it may seriously affect production in the older stands. Several distinct types of root trouble produce yellowing and death of individual plants. One type, due to *Sclerotium rolfsii* [ibid., xiii, p. 290] is somewhat widely distributed, and in some instances probably causes a definite reduction in stand, while another, caused by *Helicobasidium purpureum* [ibid., xvii, p. 326] has been found only on one farm.

Mercurial seed dressing for preventing germination losses and wilt [cause unspecified] in groundnuts has given uniformly good results. The crop is also affected by three distinct types of virus disease, none of which appears to be identical with rosette.

Field trials of different methods for the control of tobacco blue mould [*Peronospora tabacina*: see preceding abstract] indicated that when *Cercospora nicotianae* is also to be taken into consideration spraying with colloidal copper, supplemented by benzol fumigation during very wet periods, is advisable.

Field inoculation tests showed that infection of pineapples with the *Penicillium* species mainly responsible for brown speck disease [ibid., xiv, p. 216; xviii, p. 503] occurs during the flowering stage. Typical lesions develop only as the fruit reaches maturity, and vary in extent in different fruits. Experimental evidence indicated that the fluctuation observed in the incidence of pineapple marbling [loc. cit.] is due to the conditions prevailing during flowering, when natural infection by the causal bacteria probably occurs. Typical symptoms of the disease resulted from inoculations on the Ripley variety. Serious black heart [loc. cit.] was again found to be associated with poor quality of the fruit. H. K. Lewcock (p. 33) states that the occurrence of the condition is closely connected with carbohydrate metabolism. Shading the plants for one month before picking increased black heart incidence, but complete defoliation four to six weeks before fruit maturation did not. The amount of sunlight available to the plants appears to be one of the chief factors conditioning the development of the disorder, fruit on southerly slopes being more frequently affected than those on northerly ones. Similarly, fruit from the northern side of a double row is often less affected than fruit from the southern side. There is some indication that too close planting may increase incidence, and that excessive application of ammonium sulphate in autumn may predispose to the condition. Fruit picked in the early stages of ripening was affected to a greater extent in storage than immature or completely ripe fruit. The condition occurs more often in fruits with a whitish opaque flesh than in those with translucent flesh.

In tests of the effect of zinc applications on sclerosis or 'crookneck' of pineapple [ibid., xviii, p. 503] zinc sulphate applied to the soil in the form of the crystalline salt mixed with the fertilizer (first application) gave much better results than zinc sulphate used as a spray, the former method completely inhibiting the appearance of symptoms.

Following certain weather conditions in the field an appreciable amount of water blister (*Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., xi, p. 192]) develops on pineapples in transit, and the evidence obtained clearly demonstrated that the greatly increased loss from water blister that has been sustained in recent years has resulted from a corresponding increase in side or skin infections as compared with those of the stem-end. In 3,629 fruits examined, 921 side and only one stem-end infection were found. It is therefore evident that treatment of the cut stem with benzoic acid will not control the condition. The extent to which side infections develop varies with the degree of spore contamination and the amount of care exercised in picking and packing. Control is complicated by the limitations necessarily imposed by public health regulations on the range of fungicides which might be used, and by the difficulty in finding any fungicide that will adhere to the whole of the fruit surface. So far, the best results (though not amounting to complete control) have been obtained by immersing the fruit within two hours of picking in shirlan AG, but there are difficulties in this method that may render it unacceptable.

A brief survey of strawberry virus diseases showed that yellow edge [see below, p. 481] and crinkle [ibid., xviii, p. 537] were prevalent on the South Coast, the former predominating. Very little crinkle was observed on the North Coast, though yellow edge was fairly common. Under local conditions neither disease need become serious, if due attention is paid to roguing and the selection of healthy mother plants.

In comparative tests, Bordeaux mixture (4–8–40) gave no better adherence to tomato leaves than 4–4–40 or 4–2–40 mixtures, and *P*[*hytophthora*] *infestans* was equally well controlled by all three. In tests of varietal resistance to *Fusarium* [*bulbigenum* var.] *lycopersici*, the best results were given by Rutgers [cf. ibid., xviii, pp. 726, 766].

Onion smut (*Urocystis cepulae*) was recorded for the first time.

Observations in northern Queensland on root rot (*Fomes pachyphloeus*) [ibid., xii, p. 56] of maple, kauri pine [*Agathis australis*], and hoop pine [*Araucaria cunninghamii*] indicated that incidence decreases when the stumps of rain forest trees, left after the burn, reach an advanced state of decay, by which time the fungus has lost much of its activity.

Hoop pine seedlings were affected by two forms of chlorosis, one lime-induced, the other due to nitrogen deficiency brought about by using a sawdust cover for the seed-bed.

Experimental evidence indicated that the mycorrhizal fungus of hoop pine is closely allied to, if not identical with, *Boletus granulatus* [ibid., xviii, p. 406]. The typical *B. granulatus* mycorrhiza is ectotrophic on *Pinus*, but endotrophic on *Araucaria*.

Plant pathology.—*Rep. Hawaii agric. Exp. Sta., 1939*, pp. 69–74, 1940.

In this report on plant disease work in Hawaii in 1939 [cf. *R.A.M.*, xviii, p. 657] it is stated that evidence was obtained that tomato ring spot [loc. cit.], is caused by the virus of pineapple yellow spot [see below, p. 482], which was mechanically transmitted from affected tomato to healthy tomato, potato, and *Emilia sonchifolia*, from affected to healthy *E. sonchifolia*, and from affected potato to healthy potato

and tomato. The virus was also transmitted by grafting from tomato to tomato and potato, and from potato to tomato. The available evidence strongly suggests that the pineapple yellow spot virus is identical with the [tomato] spotted wilt virus.

In a comparative test against early blight (*Alternaria solani*) of potatoes, the best control was given by Bordeaux mixture (4–2–50).

DERMEN (H.) & BROWN (NELLIE A.). **A cytological study of the effect of colchicine on plant tumors.**—*Amer. J. Cancer*, xxxviii, 2, pp. 169–190, 10 figs., 1940.

Tumours artificially induced in marigolds (*Tagetes patula* and *T. erecta*) by inoculation with *Bacterium tumefaciens* were killed by effective doses of colchicin (0·1 to 1 per cent.) [*R.A.M.*, xviii, p. 446], death being due to multipolyploidy in the affected meristematic cells, which are thus prevented from dividing and increasing numerically. The growth of both the treated and control tumours proceeded normally for the first week, after which the development of the former ceased; three days later darkening and shrivelling set in. In further tests with lower concentrations of colchicin, a minimum of 0·01 per cent. was found to be necessary to produce any effect on *T. patula* tumours, the increase in nuclear size (restricted to the periphery) being conservatively estimated at four times the normal and the corresponding increases for the 0·025, 0·05, and 0·1 per cent. doses being 8, 16, and 32 times the normal, respectively, with a maximum number of chromosomes 32 times the normal (48), i.e., 1536. At a maximum estimate, the increase of chromosomes in the tumours treated with colchicin at a strength of or exceeding 0·1 per cent. would be 512 times the normal or 24,576 in the largest observed nuclei.

Attention is drawn to an important difference, having a direct bearing on methods of therapy, between the reactions to colchicin of plant and animal cells.

CONN (H. J.), WOLFE (GLADYS E.), & FORD (M.). **Taxonomic relationships of Alcaligenes spp. to certain soil saprophytes and plant parasites.**—*J. Bact.*, xxxix, 2, pp. 207–226, 4 figs., 1940.

In comparative experiments at the New York (Geneva) Agricultural Experiment Station with six species of *Rhizobium* from legumes, *Alcaligenes* and *Chromobacterium* spp., miscellaneous soil bacteria, and eight plant pathogens, *Bacterium tumefaciens* showed the closest similarities to the legume nodule organisms [cf. *R.A.M.*, xix, p. 202], with which it agrees even in the production of gum on sugar media. The crown gall agent, *Bact. rhizogenes*, *Pseudomonas savastanoi*, and *Bact. gypsophilae* [ibid., xiii, p. 772] show the same type of degenerate peritrichous flagellation as *R.* spp., as well as other characteristics described under the latter genus. Of the three strains of *Aplanobacter michiganense*, two exhibit the *R.* type of flagellation while the third is apparently non-motile. It is concluded that the plant pathogens approximating most nearly to the legume nodule bacteria should be referred to the Rhizobiaceae, the question of the disposal of the non-motile organisms being temporarily left open.

GIOELLI (F.). **L'azione di filtrati di 'Bacterium tumefaciens' su culture 'in vitro' di tessuti vegetali.** [The action of filtrates of *Bacterium tumefaciens* on cultures of plant tissues *in vitro*.]—*Riv. Pat. veg.*, xxx, 3–4, pp. 117–135, 5 figs., 1940.

Experimental evidence [which is described in detail] is adduced to show that an extract of the filtrates from cultures of *Bacterium tumefaciens* [*R.A.M.*, xix, p. 201] added to cultures of plant tissue (i.e. cambial tissues of *Sterculia platanifolia* in Knop's solution) *in vitro* functions as a growth hormone in the same way as the hetero-auxin indoleacetic acid is known to act. It is concluded that *Bact. tumefaciens* produces neoplastic proliferations by the action of chemical substances of the nature of hormones, which stimulate cellular division even in tissues outside the infected area.

ANDRÉN (F.). **Resultatet från betningsförsök.** [Results of disinfection experiments.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1940*, 1, pp. 3–7, 1940.

In this account of further cereal seed-grain disinfection experiments in Sweden in 1939 [*R.A.M.*, xix, p. 267], the writer tabulates and discusses the data obtained in combined disease control and yield tests in various centres. All the preparations used, namely, tutan, abavit-neu, fusariol, and uspulun dusts (each at the rate of 200 gm. per kg.), germisan and uspulun steeps (0·125 per cent. for 30 mins.), and uspulun sprinkle (50 gm. per 3 l.), were effective against wheat bunt [*Tilletia caries* and *T. foetens*], the average incidence of which among the untreated lots was 25·7 per cent. The maximum yield of 4,680 kg. seed per hect. (30·7 per cent. above the control) was obtained with tutan (200 gm. per kg.), but as regards the elimination of infection there was little to choose between the fungicides, all of which reduced the percentage of bunt to under 1 (0·2 for tutan); generally speaking, however, dry materials are preferable to liquid for the control of this disease.

Rye fusariosis [*Calonectria graminicola*] was not severe even in the untreated samples, but nevertheless substantial increases in yield followed disinfection, the maximum of 16·8 per cent. above the control being obtained with 0·125 per cent. germisan (30 minutes' immersion).

Barley stripe [*Helminthosporium gramineum*] was most effectively combated by abavit-neu (200 gm.) and the new oil-soluble panogen (175 gm.), both of which reduced infection to the merest trace; satisfactory results were also secured with uspulun [ceresan] U.T. 1875b (200 gm.), 30 minutes' immersion in 0·125 per cent. uspulun, uspulun sprinkle (2·5 per cent. per 3 l.), and a 30-minute dip in 0·125 per cent. fusariol 2115. Both germisan dust (200 gm.) and germisan retorte (0·125 per cent., 30 minutes) proved superior to the older brand of germisan and to tutan, the last-named, in fact, being the least valuable of all the preparations in current use against barley stripe, rye fusariosis, and loose smut of oats [*Ustilago avenae*].

The best control of *U. avenae* was given by panogen (275 gm.), abavit-neu, and 15 minutes' immersion in mercuric chloride-formalin (0·1 per cent.), the first-named eliminating all but a trace of the smut. Ceresan U.T. 1875b (300 gm.) and liquid uspulun (one hour in a 0·25 per cent. solution) were also efficacious.

STAKMAN (E. C.), POPHAM (W. L.), & CASSELL (R. C.). **Observations on stem rust epidemiology in Mexico.**—*Amer. J. Bot.*, xxvii, 2, pp. 90–99, 1 map, 1940.

Observations made during 1938–9 show that the uredinial stage of *Puccinia graminis* can persist throughout the year in southern Mexico, because wheat is grown there almost continuously all the year round. It is probable that the rust could be controlled to a considerable extent by eliminating the relatively small amount of summer wheat and prematurely sown fields of winter wheat. Races 38 and 59 have been by far the most prevalent in southern Mexico during at least the last decade. In fairly adequate surveys made from 1928 to 1931, inclusive, and in 1938–9, they comprised over 80 per cent. of all the isolates obtained, none of the other 14 races found being of importance. The exclusive importance of races 38 and 59 is further demonstrated by the fact that Marquis wheat, grown in parts of southern Mexico because of its resistance to these two races, did not suffer from rust for a number of years. In northern Mexico, according to race surveys from 1928 to 1939, inclusive, the high percentage of isolates yielded race 38, followed by 49 and 56. It is concluded that little interchange of rust has taken place between southern Mexico and the wheat-growing areas of north-eastern Mexico and the United States [*R.A.M.*, xix, p. 394] during the past ten years, since neither race 49 nor 56 has been found in southern Mexico during this time, despite the prevalence in northern Mexico and the United States of race 49 during the first half of the decade, and of race 56 during the second. There is evidence, based on study of the movement of spores in the air and subsequent distribution of physiologic races of the rust, that there is sometimes an interchange of *P. graminis* between the United States and northern Mexico; early-sown winter wheat in northern Mexico may become infected from uredospores blown from the United States in the autumn, while spores may be blown into the United States in the winter or early spring. There is also a definite tendency for the prevalence of certain races in northern Mexico and the United States to fluctuate together. The prevalence of race 38 both in southern and northern Mexico and in the United States does not necessarily indicate that there is an interchange between the three regions. It may be explained by the fact that this race is well suited for overwintering and is also commonly isolated from rusted barberries in the Ohio Valley and eastern United States. The uredinial stage of *P. graminis* appears to persist throughout the year, at least to some extent, in certain mountain valleys of northern Mexico, but the importance of this survival has not yet been determined. The role of numerous native barberries is not yet known.

HASSEBRAUK (K.). **Zur Frage der Wirkung von Aussenfaktoren auf verschiedene Stadien von Weizenbraunrostinfektionen.** [On the question of the effect of external factors on various stages of Wheat brown rust infections.]—*Phytopath. Z.*, xii, 5, pp. 490–507, 1940.

A tabulated account is given of the writer's further investigations (not yet completed) at the Gliesmarode (Brunswick) branch of the Biological Institute on the influence of external factors on different phases of brown rust of wheat (*Puccinia triticina*) [*R.A.M.*, xviii,

p. 731]. Generally speaking, the effect of darkness, a steam-saturated atmosphere, or a low temperature (4° C.) in the early stages of infection was to lower the resistance to infection of moderately, and in some cases even of highly, resistant varieties; exposure to these influences in the middle phases tends to retard the appearance of pustules but does not ordinarily modify the varietal reactions; at an advanced stage the treated plants mostly acquired enhanced resistance.

HASSEBRAUK (K.). **Abschliessende Untersuchungen über die feldmässige Verwendungsmöglichkeit von p-Toluolsulfonamid als innertherapeutisch wirkendes Getreiderostbekämpfungsmittel.** [Final investigations on the possibility of field utilization of p-toluolsulphonamide as an internal therapeutic for the control of cereal rusts.]—*Phytopath. Z.*, xii, 5, pp. 509–510, 1940.

Contrary to the expectations aroused by the successful results of greenhouse experiments, paratoluolsulphonamide (1 to 20 gm. per sq. m. of soil) [*R.A.M.*, xvii, p. 663] entirely failed to control yellow and brown rusts of Michigan and Carsten V wheat [*Puccinia glumarum* and *P. triticina*] in the field at Gliesmarode (Brunswick) and caused heavy damage to the plants.

LIMBER (D. P.). **Notes on the stinking smuts of Wheat from Afghanistan in 1939.**—*Plant Dis. Reptr*, xxiv, 6, p. 136, 1940. [Mimeographed.]

Of 53 samples of wheat recently examined from 11 localities in Afghanistan 18 bore bunt balls of *Tilletia levis* [*T. foetens*] and one those of *T. tritici* [*T. caries*]. The relative prevalence of the two species is thus very similar to that obtaining in Turkey, where *T. foetens* also predominates.

LANGE-DE LA CAMP (MARIA). **Blüteninfektionen mit Myzel von Ustilago tritici.** [Blossom infections with mycelium of *Ustilago tritici*.]—*Z. PflKrankh.*, l, 3–4, pp. 142–180, 2 figs., 1940.

After much difficulty the writer succeeded in obtaining inoculum of *Ustilago tritici* for experimental purposes by mixing freshly growing hyphae of opposite sex from subcultures and preparing suspensions from the resultant mycelium [*R.A.M.*, xvi, p. 240]. Although certain combinations were more virulent than others in tests on the Grüne Dame, Peragis, and Hohenheimer 25 f wheat varieties, infected through the stigma under very humid conditions, such differences cannot with certainty, pending extended analyses of haplont combinations of the progeny, be ascribed to genetic factors. A number of plants inoculated with mycelial combinations in which line 13/5d was a partner showed an abnormal type of infection characterized by the confinement of malformation and spore production to the lower half of the ear.

WINTER (G.). **Untersuchungen über den Einfluss biotischer Faktoren auf die Infektion des Weizens durch Ophiobolus graminis.** [Investigations on the influence of biotic factors on the infection of Wheat by *Ophiobolus graminis*.]—*Z. PflKrankh.*, l, 3–4, pp. 113–134, 1940.

Continuing his studies at the Bonn Phytopathological Institute on

the relation of edaphic factors to the infection of wheat by *Ophiobolus graminis* [*R.A.M.*, xix, p. 269], the writer found that, contrary to Garrett's assumption, the accumulation of carbon dioxide in the soil (loose compost and loess of 40 per cent. moisture-holding capacity in these experiments) is not a limiting factor in the development of the 'runner' hyphae [ibid., xvii, p. 230]. This result would appear automatically to dispose of Garrett's corollary regarding the superior development of the fungus after partial sterilization of the soil [ibid., xiii, p. 433] involving a temporary decrease in the carbon dioxide content of the atmosphere. However, in the very damp, dense clay soils with which Garrett apparently worked, it is possible that the stimulus afforded to the growth of the pathogen by sterilization might be correlated to some extent with a modification in the partial pressure of carbon dioxide.

Aqueous extracts of compost soil in strong concentrations, treated for 30 minutes in the autoclave, stimulated the development of 'runners' in quartz sand, an effect presumed to be due to the destruction by heat of microbial substances in the soil solution which are normally toxic to *O. graminis*. It must be remembered, however, that heating of the soil, like any other form of partial sterilization, brings about changes in other factors, such as the nutrient content, and its influence on the development of a given pathogen is only one aspect of a complex microbiological phenomenon.

ADAM (D. B.). **On the occurrence of Cercosporella herpotrichioides Fron in South Australia.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 48–51, 2 figs., 1940.

Cercosporella herpotrichoides (which the author considers should be spelt in the way originally proposed by Fron, i.e., as *C. herpotrichioides*) is here recorded for the first time on wheat, causing eyespot lodging [*R.A.M.*, xviii, p. 448], in South Australia. The disease occurred in experimental plots at the Waite Agricultural Research Institute where it was first suspected in November, 1937. There is no indication that infection has been recently introduced.

PADWICK (G. W.). **A new disease of Wheat in India.**—*Curr. Sci.*, ix, 4, pp. 179–180, 1940.

In March, 1939, Pusa 12 wheat plants at Pusa developed a condition in which they became bleached and prematurely ripened, while the ears contained only shrivelled grains, the subcoronal internodes were shiny black, and the roots were black and decayed. Isolations from ten pieces of diseased tissue yielded seven cultures of *Fusarium* and one culture the mycelial characters of which resembled those of *Ophiobolus graminis*, but which produced no perithecia or spores. When Pusa 12 seed was sown in pots of previously sterilized maize meal-soil experimentally inoculated with the fungus, the plants that developed were withered, pale, and yellowish, and much smaller than the controls grown in uninoculated soil. The bases of the stems of the infected seedlings were flecked with black, and the roots were black and shiny and bore macrohyphae characteristic of *O. graminis*, though it is not possible to

determine the fungus precisely in the absence of perithecial formation. The disease is considered to be new to India.

Colquhoun (T. T.). **Effect of manganese on powdery mildew of Wheat.** —*J. Aust. Inst. agric. Sci.*, vi, 1, p. 54, 1940.

When manganese sulphate was applied at rates of 0, 16, 32, and 264 lb. per acre to Ranee 4H wheat plants grown in quartz sand in pots in a glasshouse in South Australia, each addition significantly reduced infection by *Erysiphe graminis* (which developed very freely) below that of the preceding smaller dressing, the disease ratings (from 0 for unaffected to 5 for severely affected plants) per mean of 60 plants for these treatments being, respectively, 3·37, 3·12, 2·83, and 1·45.

Bekæmpelse af Plantesygdomme. [Control of plant diseases.] *ex* **Oversigt over Resultaterne af Landboforeningens Forsøgsvirksomhed paa Sjælland 1939.** [Survey of the results of the Agricultural Association's work in Zealand in 1939.]—*Beretn. Planteavl, Sjælland, 1939*, pp. 311–340, 1940.

In experiments in Denmark, the incorporation of manganese sulphate with the soil at the rate of 30 kg. per hect. for the control of grey speck of wheat [*R.A.M.*, xviii, p. 88] increased the grain and straw yields by 620 and 640 kg. per hect., respectively, the corresponding figures for the 60 kg. dose being 640 and 700, respectively.

Olsen (H. K.). **Forsøg og Undersøgelser vedrørende kemiske Midler til Bekæmpelse af Plantesygdomme og Ukrudt.** [Experiments and investigations relating to chemical means for the control of plant diseases and weeds.]—*Beretn. Planteavl, Sjælland, 1939*, pp. 220–229, 1940.

The following are some of the data presented in this statistical analysis, accompanied by explanatory notes, of the results of co-operative experiments in Denmark in 1939 in the control of cereal diseases by chemical treatments. The incidence of barley stripe [*Helminthosporium gramineum*] (average of 16 tests) was reduced from 2·9 to 0·1, 0·1, 0·1, 0·3, 0·1, 0·1, and 0·3 per cent., respectively, by dahmit (150 c.c. per 100 kg. seed-grain) [*R.A.M.*, xvii, p. 594], sanagran (75 gm.), dansk tillantin (75), betasan dust (75), tillantin [ceresan] 1875 dry (75), G.V. I dust (90), and G.V. II dust (100), the corresponding figures for the same preparations over the period 1930 to 1939 being 0·2, 0·1, 0·1, 0·2, 0·1, 0·1, and 0·3, respectively, as against 5·5 in the controls. Increased barley yields of up to 630, 580, and 450 kg. per hect. were secured by the use of dahmit, sanagran, and ceresan 1875, respectively, the corresponding figures for oats (treated against loose smut [*Ustilago avenae*]) being 210, 140, and 110 kg., respectively. Barley stripe was much the most serious of the diseases observed in the course of the 1939 field inspections, especially in Jutland.

Reed (G. M.). **Physiologic races of Oat smuts.**—*Amer. J. Bot.*, xxvii, 3, pp. 135–143, 1940.

In studies conducted at the Brooklyn Botanic Garden, 58 collections of *Ustilago avenae* and *U. levis* [*U. kolleri*] from widely separated regions were tested on about 200 varieties and strains of nine species of oats.

Twenty-nine physiologic races of the former and 14 of the latter smut [cf. *R.A.M.*, xviii, p. 16] were separated on the basis of their behaviour on definite strains of 17 and 10 varieties of oats, respectively. Susceptible varieties gave 75 to 100 per cent. infection, while the resistant ones yielded no or only a few smutted plants. Some varieties consistently showed a variable percentage of infection. Thus, the percentage of infection in Red Rustproof ranged on the average from about 45 to 60, but in some cases rose to 100. Some races showed a high degree of specialization (race 11 of *U. avenae*, for instance, infected only one strain of *Avena barbata*), while others occurred on a wide range of strains or varieties. One or more strains of all nine species used were susceptible to at least one race of either smut. So far as tested, no species or variety of oats was susceptible to all the races. Canadian was susceptible to all races of *U. avenae* except 11, and to all of *U. kolleri* except 2; Monarch was suceptible to many races of *U. avenae* and to all of *U. kolleri* except 2 and 5. *A. barbata* was infected by 13 races of *U. avenae* and 2 of *U. kolleri*, but was not tested with the others. The Markton, Navarro, and Victoria varieties proved resistant to practically all races of both smuts.

Poos (F. W.). **Host plants harboring Aplanobacter stewarti without showing external symptoms after inoculation by Chaetocnema pulicaria.**—*J. econ. Ent.*, xxxii, 6, pp. 881–882, 1939.

In a series of tests at the Arlington Experiment Farm, Virginia, in 1938–9, typical symptoms of bacterial wilt (*Aplanobacter stewarti*) were produced in susceptible maize (sweet corn) by inoculation with juice expressed from the following plants upon which adults of *Chaetocnema pulicaria* had fed for several days [*R.A.M.*, xvii, p. 740]: Golden Cross and Gill Brothers' Golden Bantam field maize, *Digitaria* sp., *Panicum dichotomiflorum*, *P. capillare*, *Coix lacryma-jobi*, *Poa pratensis*, *Dactylis glomerata*, *Agrostis alba*, *Sorghum vulgare* var. *sudanense* [*S. sudanense*], wheat, and *Setaria lutescens*: of these only maize, *C. lacryma-jobi*, and *S. lutescens* have been reported as showing external symptoms of the disease. Further evidence that the pathogen overwinters in *Chaetocnema pulicaria* was obtained by the development of typical wilt symptoms in susceptible sweet corn plants into which was introduced inoculum from adults of the insect taken from emergence cages and placed on several different species of grasses in the field in February.

It is considered highly probable that the occurrence of symptomless hosts of *A. stewarti* in the field may play an important part in the spread of wilt through the agency of *C. pulicaria*.

Stevens (N. E.) & Haenseler (C. M.). **Sixth experimental forecast of the incidence of bacterial wilt on Sweet Corn.**—*Plant Dis. Reptr*, xxiv, 6, pp. 122–129, 1 graph, 1 map, 1940. [Mimeographed.]

Over most of the area under observation the winter of 1939–40 was the coldest in the United States since 1936, and an application of the available meteorological data to the annual experimental predictions of the anticipated incidence of bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) on maize [*R.A.M.*, xviii, p. 588] indicates that commercially significant losses are not to be generally expected along the

eastern seaboard north of Maryland and central New Jersey. In Ohio and Indiana losses are not to be expected on sweet corn, unless the prevalence of the disease in field maize results in an exceptionally high carry-over of the pathogen.

LINCOLN (R. E.). **Bacterial wilt resistance and genetic host-parasite interactions in Maize.**—*J. agric. Res.*, lx, 4, pp. 217–239, 2 figs., 3 graphs, 1940.

In this full account of his studies on *Phytomonas* (*Aplanobacter*) *stewarti* [*R.A.M.*, xviii, p. 516; and cf. xix, p. 209] on maize, the author states that loss in virulence on passage through susceptible lines of maize was always associated with a raised, firm type of colony on nutrient dextrose agars but not always with a change from the smooth to the rough phase; increase in virulence on passage through a resistant lines was associated with a more spreading, watery, and viscid growth, and changes in the growth from rough to smooth and from smooth to rough were observed during passage. Virulence of passage cultures was again changed by reversing the hosts through which they passed. From his experiments with single-cell isolations from an old stock culture, which was found to comprise many variants differing in virulence, the author concludes that the virulence of a culture is determined by the proportion of virulent and avirulent types present in the culture. Single-cell cultures consistently decreased in virulence after passage through a susceptible host, but retained their virulence almost unchanged after passage through a resistant host. When mixed inoculum of virulent and avirulent bacteria was used, there was a differential selection for the avirulent type in the susceptible host and for the virulent type in the resistant one in all 14 lines and 2 crosses of maize used, with one exception only. Both direction and rate of change were dependent upon host resistance and bacterial virulence. The mutation rate of colony colour and morphology of three bacterial strains after 18 hours' growth in nutrient broth, ranged from 1 in 20,000 to 1 in 800,000 individual cells, thus being of the same order as the known mutation rate of the genus in higher forms. The virulence of the mutations varied greatly, in either direction, from that of the parent stock. Sexual fusion of white and yellow strains of the organism in the living host could not be demonstrated experimentally.

SCOSSIROLI (G. O. R.). **Ustilago maydis e autarchia.** [*Ustilago maydis* and autarchy.]—*Riv. ital. Essenze*, xxii, 3, pp. 82–86, 8 figs., 1940.

Suggestions are made for the artificial propagation, under proper safeguards to avoid widespread epidemics, of maize smut (*Ustilago maydis*) [*U. zeae*] for medicinal purposes [*R.A.M.*, xv, p. 223 *et passim*] as an adjunct to *Claviceps purpurea* in Italy [ibid., xix, p. 95].

EDWARDS (E. T.). **Internal grain infection and kernel rot in the 1938 American Maize crop.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 25–31, 1940.

During the 1938 survey of the relative prevalence and distribution of fungi causing kernel rot of maize in the United States [*R.A.M.*, xviii, p. 669], which was based on examination of the damaged kernels, the

author made a study of the sound grain samples with a view to investigating the nature and prevalence of internal grain infection over the wide area concerned, and obtaining definite information as to the regional relationships of the two types of infection. From each sound sample 50 grains were used, any grain that showed external evidence of rotting or injury being discarded.

The results showed that the relative frequency of *Diplodia zeae* as an internal seed-borne organism in Illinois, Indiana, Ohio, Delaware, and Maryland was 7·1, 7·2, 2, 5·5, and 5 per cent., respectively, compared with total infection of 69·8, 64·5, 51·1, 46·9, and 40 per cent., respectively. It was not recorded at all from Kansas, Nebraska, and Colorado.

Gibberella zeae [*G. saubinetii*: ibid., xix, p. 117] caused the maximum internal infection (16·7, 13·0, and 6·0 per cent., respectively), in Maryland, Delaware, and Ohio, and was absent from Missouri, Nebraska, Kansas, Colorado, and Tennessee.

G. fujikuroi was the only fungus occurring as an internal seed-borne organism in all States. The degree of internal infection ranged from 57·1 per cent. in Nebraska to 4·7 per cent. in Ohio and it was the most prevalent internal organism in all areas except Ohio, Indiana, and Illinois. *G. fujikuroi* var. *subglutinans* was isolated on a number of occasions from apparently sound maize grown at Madison, Wisconsin.

Nigrospora sphaerica was unimportant as a cause of kernel rot, but was considerably more prevalent as an internal seed-borne organism, occurring in six States in this manner only. It was the most prevalent internal organism in Ohio (27·3 per cent.), and its incidence in Minnesota, Illinois, and Indiana was 13·9, 11·2, and 8·2 per cent., respectively.

Cephalosporium acremonium was seldom associated with kernel rot, but occurred as an internal seed-borne organism in all States, and was most prevalent in Tennessee, Kansas, Missouri, and Iowa, where its incidence was 26·7, 25·6, 25·1, and 20·6 per cent., respectively.

Species of *Penicillium* were relatively prevalent only in Minnesota and Indiana, the figures for internal infection being 9·4 and 5 per cent., respectively.

In Minnesota, Ohio, Maryland, Delaware, and Iowa miscellaneous fungi were an important factor in the causation of kernel rot, and were also common as internal, seed-borne organisms, the incidence of this type of infection in these States being 14·2, 10, 14·8, 12, and 10 per cent., respectively. These miscellaneous fungi consisted principally of *Rhizopus* spp., *Chaetomium* sp., *Trichoderma* sp., *Aspergillus* spp., *A. niger*, *Cephalothecium* [*Trichothecium*] *roseum*, and some unidentified organisms.

The organisms invading maize ears fall into two distinct types. In general, *D. zeae* and *G. zeae* are vigorously pathogenic, and infection by these is usually followed by marked rotting of the tissues, while organisms such as *G. fujikuroi* and its var. *subglutinans*, *N. sphaerica*, and *Cephalosporium acremonium* are not actively pathogenic, and may not produce any recognizable symptoms.

The evidence obtained showed that in the States where *G. fujikuroi* was most prevalent as a cause of kernel rot it was also the commonest internal seed-borne organism. Where *D. zeae* was the most prevalent cause of kernel rot, on the other hand, it was relatively unimportant

as an internal seed-borne organism. Often, *D. zeae* was very prevalent as the cause of kernel rot, while the corresponding samples from the same States of sound grain showed heavy internal infection by *G. fujikuroi*. *G. saubinetii* was rarely found in ears not showing obvious infection. With *C. acremonium* and *N. sphaerica* there was no correlation between kernel rot and internal grain infection. The pathogenicity of the former is doubtful, and though it occurred rather commonly as an internal organism, it was seldom associated with kernel rot. *N. sphaerica* does not usually cause kernel rot, but occasionally invades the ears, and generally causes severe rotting of the cob. Internal infection by *N. sphaerica* probably results from cob invasion, frequently where no grain rot occurs.

MILLER (E. V.), WINSTON (J. R.), & FISHER (D. F.). **Production of epinasty by emanations from normal and decaying Citrus fruits and from Penicillium digitatum.**—*J. agric. Res.*, lx, 4, pp. 269–277, 4 figs., 1940.

It is stated that tissues of a considerable number of plants are known to evolve a gaseous substance, very probably ethylene, causing epinasty in test plants. In the present study fruits of orange, tangerine, grapefruit, lemon, and lime were stacked round potted test plants (potato, tomato, and sunflower) on a wire platform in a wide-mouthed jar. Potassium hydroxide pellets were placed under the wire platform to absorb the carbon dioxide produced by the fruit. Epinasty of the leaves of the test plants was induced by all the citrus fruits used. Grapefruit and oranges inoculated with *Penicillium digitatum* and oranges showing stem-end rot (*Diplodia natalensis* and *Diaporthe citri*) induced epinasty more quickly than did sound fruit. Epinasty was also induced by pure cultures of *P. digitatum*, but the results obtained with those of the stem-end rots and *Alternaria citri* were either negative or inconclusive.

MAYNE (W. W.). **Coffee spraying.**—*Plant. Chron.*, xxxv, 9, p. 175, 1940.

As the blossom showers had not fallen in southern India by 12th April, it is suggested that spraying against coffee leaf disease (*Hemileia* [*vastatrix*: *R.A.M.*, xix, p. 403]) can be postponed in areas where a great deal of old leaf has been lost until after the heaviest rains of the south-west monsoon, i.e., until August. Areas with a heavy head of leaf and about to bear heavily should be sprayed before the south-west monsoon.

GREATHOUSE (G. A.) & RIGLER (N. E.). **The chemistry of resistance of plants to Phymatotrichum root rot. IV. Toxicity of phenolic and related compounds.**—*Amer. J. Bot.*, xxvii, 2, pp. 99–108, 1940.

In further studies on the nature of resistance of plants to *Phymatotrichum omnivorum* [*R.A.M.*, xviii, p. 24; xix, p. 147] the authors tested a total of 45 phenolic and related compounds upon pure cultures of the fungus. When only one group was attached to benzene the order of toxicity was phenol > thiophenol > benzoic acid > benzaldehyde > anisole. When two groups were attached, the toxicity was conditioned not only by the nature of the two groups but also by their positions round the benzene ring: for the dihydroxybenzenes, the order of position toward toxicity was para > ortho > meta; for the dihydroxybenzoic

acids, para = ortho > meta; for the methylphenols and the methylbenzoic acids, para > meta > ortho; and for the aminophenols, ortho > para = meta. Introduction of a second group into phenol or thiophenol decreased the effectiveness, while combination of a second group with benzoic acid or anisole increased it. Methylation of phenols decreased toxicity except where the two hydroxyls were in the meta position to each other. The addition of a basic amino group in the ortho position to hydroxyl enormously increased toxicity, while the same group in the meta or para position decreased it. When the hydroxyl group was methylated, as in the anisidines, the potency of the ortho compound was greatly diminished while that of the other two isomers was increased. The effect of addition of a carboxyl group varied with the potency of the group already present: the toxicity was decreased when it was a potent group, such as hydroxyl, and greatly enhanced when it was a weak group, such as methoxyl. When more than one group was present, there seemed to be little difference in toxicity between the aldehyde and the carboxyl groups. The substitution of sulphur for oxygen to form thiophenols resulted in a decrease of potency. With an increase in the number of groups attached to benzene, it became more difficult to determine the part played by each; the activity increased when alkyl groups were added, and it was usually lessened when a number of hydroxyl groups were present. Pyrogallol, however, was very toxic in contrast to its isomer, phloroglucinol. Isomerism was observed to play an important part in all types of compounds.

LEACH (J. G.), HODSON (A. C.), CHILTON (St. J. P.), & CHRISTENSEN (C. M.). **Observations on two ambrosia beetles and their associated fungi.**—*Phytopathology*, xxx, 3, pp. 227–236, 4 figs., 1940.

A full account is given of the writers' studies from 1934 to 1936 on the life-histories of two species of 'ambrosia' beetles occurring in great abundance on dying aspen and paper birch (*Betula papyrifera*) in Itasca Park, Minnesota, viz., *Trypodendron retusum* and *T. betulae*, respectively, and their associated fungi, the latter being investigated in pure culture on potato dextrose agar as well as in nature.

The two fungi isolated are considered to be very closely related strains of one species which clearly differs from Trotter's *Ambrosiaemyces zeylanicus* [*R.A.M.*, xiv, p. 167], but is probably related to *Monilia candida*, originally described by Hartig in association with *Xyleborus dispar* (*Allg. Forst- u. Jagdztg*, xiii, pp. 73–75, 1844). The same name was applied by Castellani to a human pathogen of totally different characteristics and this fungus was renamed *Candida* [*vulgaris*] by Miss Berkhout [*R.A.M.*, iii, p. 555], who apparently overlooked Hartig's species. Pending further and more intensive studies, the ambrosia fungi connected with *T. retusum* and *T. betulae* should be regarded as strains of *M. candida* Hartig.

KRUG (H. P.). **Una nova espécie de Hypocrella.** [A new species of *Hypocrella*.]—*J. Agron., S. Paulo*, iii, 1, pp. 69–82, 12 figs. (1 col.), 1940. [English summary.]

Portuguese and Latin diagnoses are given of *Hypocrella fluminensis* n.sp., found parasitizing an Aleyrodid on the foliage of wild canes in

the State of Rio de Janeiro, Brazil, and differing from the related *H. turbinata* [*R.A.M.*, xv, p. 579] in a number of important particulars.

DUDDINGTON (C. L.). **Predaceous Phycomycetes from Cotswold leaf-mould.**—*Nature, Lond.*, cxlv, 3665, pp. 150–151, 1940.

The writer has isolated in pure culture from leaf mould from wooded areas in the Cotswolds four species of Zoopagaceae corresponding with those described from the United States by Drechsler as *Cochlonema verrucosum*, *C. dolichosporium*, *Stylopage haploe*, and *S. hadra* [*R.A.M.*, xiv, p. 508; cf. also xviii, p. 798]. The three first-named are parasitic on amoebae while *S. hadra* preys on nematodes.

SMITH (R. I.). **Studies on two strains of Aphanomyces laevis found occurring as wound parasites on Crayfish.**—*Mycologia*, xxxii, 2, pp. 205–213, 1 fig., 1940.

Two strains of *Aphanomyces levis*, designated A and B, acting as mild, facultative parasites, were isolated at Cambridge, Massachusetts, from young crayfish kept in the laboratory. The two strains showed certain physiological differences: on maize meal agar, A showed a sparse, and B a very dense aerial growth; A formed oogonia rapidly and in great numbers, but scarcely ever produced zoospores, whereas B formed oogonia only very rarely, but produced many zoospores. In reviewing the literature on *A. levis*, the author points out that the obvious disagreement existing among the several physiological descriptions of this species may well be a reflection of its great variability in nature, which is strikingly shown in the reproductive habits of the two strains described in this paper.

THORNER (JULIET E.). **Erythema nodosum in childhood associated with infection by the Oidium coccidioides. Report of seven cases.**—*Arch. Pediat.*, lvi, 10, pp. 628–638, 3 figs., 1939.

Clinical details are given of seven benign cases of erythema nodosum (*Coccidioides immitis*) in children aged from 3½ to 13 years in California [*R.A.M.*, xix, p. 218], the identity of the fungus being established by culture on Sabouraud's medium and recovery from guinea-pigs after inoculation.

GUNTER (W. A.) & LAFFERTY (C.). **Histoplasmosis of Darling: report of case.**—*J. med. Ass. Ala*, ix, 10, pp. 337–339, 2 figs., 1940.

The fungus isolated from tissues of the internal organs in a fatal case of histoplasmosis (the ninth in the medical literature and the first in Alabama) in a 54-year-old woman was identified by W. A. De Monbreun as *Histoplasma capsulatum* [*R.A.M.*, xviii, p. 456].

LANGERON (M.) & GUERRA (P.). **Orientation de la filamentisation des champignons levuriformes cultivés sur lames gélosées.** [The orientation of hyphal formation in yeast-like fungi cultured on agar slides.] —*Ann. Parasit. hum. comp.*, xvii (*1939–40*), 6, pp. 580–589, 30 figs., 1940.

In the course of culturing yeast-like fungi in multiple streaks on agar-coated slides the writers have observed that the streaks, when situated

in unduly close proximity, exert two reciprocal effects which determine the orientation of hyphal formation, viz., firstly, a preventive action restricting or even completely inhibiting the production of hyphae in the zone separating one streak from another; and, secondly, a contrary action which permits normal hyphal formation to take place on the other side of the streak. It is concluded that the preventive influence is an expression of activity on the part of the living cells, independent of the identity of the fungus concerned (in these experiments *Candida tropicalis* [*R.A.M.*, xix, p. 278] was grown in association with *C. albicans*, *C. parakrusei*, *Rhodotorula mucilaginosa*, *Hormodendrum* sp., and *Trichosporon* sp.), and resulting from modifications in the medium produced either by the diffusion of inhibitory substances arising from the surface of the streak, from the withdrawal of essential nutrients, or from a combination of these two factors.

REEVES (R. J.). **The roentgenologic significance of bronchomycosis. Case reports.**—*Sth. med. J.* (*J. sth. med. Ass.*), xxxiii, 4, pp. 361–366, 9 figs., 1940.

Clinical details are given of six cases of pulmonary mycosis at the Duke Hospital, North Carolina, in which the application of X-rays to the bronchi assisted in diagnostic procedure [*R.A.M.*, xix, p. 217]. *Candida albicans* was among the fungi isolated from the sputum.

BIGG (E. M.) & SHELDON (J. M.). **Air borne fungus spore counts of Ann Arbor, Michigan.**—*Univ. Hosp. Bull., Ann Arbor, Mich.*, v, 6, p. 43, 1 graph, 1939.

For the first time in south-eastern Michigan, in connexion with the clinical study of respiratory allergy, counts of air-borne fungus spores were initiated at Ann Arbor in February, 1938, when dextrose-tartaric acid plates were exposed to the air for 15 minutes every three days until the following September [cf. *R.A.M.*, xviii, p. 799]. The following organisms predominated: *Alternaria*, *Hormodendrum*, and *Penicillium* spp. and yeasts, peaks being reached in the early spring and autumn.

TESAURO (S.). **Considerazioni cliniche su di un caso non comune di microbide da Trichophyton gypseum asteroides.** [Clinical aspects of an uncommon case of microbid due to *Trichophyton gypseum asteroides*.]—*Gazz. Osp. Clin.*, xl, 32, pp. 756–758, 761, 1939.

This is a detailed account and critical discussion of an unusual case of annular infection of the left hand, followed by secondary extension to the right hand and soles of the feet, due to *Trichophyton gypseum asteroides* [*T. mentagrophytes*] in a doctor treated at the Pavia Dermatological Hospital.

TOLMACH (J. A.) & SCHWEIG (J.). **Generalized Trichophyton purpureum infection simulating dermatitis herpetiformis: report of a case.**—*Arch. Derm. Syph., Chicago*, xli, 4, pp. 732–735, 2 figs., 1940.

Full clinical details are given of a case of generalized and atypical infection by *Trichophyton purpureum* [*R.A.M.*, xvii, p. 679] in a 38-year-old Hungarian in New York.

GÖHRING (G.). **Beiträge zur Kultur des Mikrosporon furfur.** [Contributions to the culture of *Microsporon furfur*.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxlv, 6, pp. 322–328, 4 figs., 1940.

Like other workers with *Microsporon* [*Malassezia*] *furfur*, the writer experienced great difficulty in obtaining the fungus in pure culture [*R.A.M.*, xix, p. 346], but succeeded in doing so on Grütz's malt-peptone agar with scales from a 20-year-old girl suffering from pityriasis versicolor at Nürnberg. The radially furcate colonies resembled those described by Marquardt [ibid., xvi, p. 456] except in their rather more pronounced purple tinge. The organism proved to be pathogenic to guinea-pigs.

MARCHI (C.). **Setticemia consecutiva a tigna favosa.** [Septicaemia as a sequel to favous ringworm.]—*G. ital. Derm. Sif.*, lxxx, 4, pp. 726–737, 5 figs., 1939.

Achorion schoenleini was isolated from the blood-stream as well as from the hair of a ten-year-old Sardinian boy who contracted generalized septicaemia as a sequel to favus of the scalp [*R.A.M.*, xix, p. 216].

LAMMERTS (W. E.). **Ethyl mercury iodide—an effective fungicide and nemacide.**—*Phytopathology*, xxx, 4, pp. 334–338, 2 figs., 1940.

Excellent control of both pre- and post-emergence damping-off [? *Pythium de Baryanum* and *Corticium solani*] is stated to have been obtained in the writer's experiments in California by the application to the soil of boxes planted with stocks [*Matthiola incana*], *Phlox drummondii*, White Perfection *Viola cornuta*, and asters [*Callistephus chinensis*] of Du Bay 1155–HH (Bayer-Semesan Co., Inc.), containing 5 per cent. ethylmercury iodide, at the rate of 1½ gm. per sq. ft. From 5 to 14 times more seedlings emerged and survived in the treated boxes than in the controls and subsequent growth was altogether more vigorous in the former than in the latter.

GADD (C. H.) & LOOS (C. A.). **Lily mosaic.**—*Trop. Agriculturist*, xciv, 3, pp. 160–167, 7 figs., 1940.

Several Easter lily plants in a private garden in Ceylon were affected by a mosaic disease [cf. *R.A.M.*, xix, p. 411]. The lower leaves of the diseased plants were normal, but the upper were somewhat paler with numerous light green or yellowish, broad streaks or spots, usually about 5 mm. long but sometimes up to 6 cm., which tended to coalesce into irregular blotches. As the leaves expanded they became markedly curled. Later the chlorotic areas became white and desiccated in the middle and soon turned rusty and died. With one exception, the flowers opened normally, with only a slight distortion. The disease was readily transmitted to healthy lily plants by a green aphid [unidentified], and also to cucumber, tomato, and turnip, but in these plants the virus did not become systemic. The symptoms caused did not correspond precisely with those described for *Cucumis* virus 1 and it is suggested that the Ceylon virus may be a variant of this virus. The removal and destruction of infected plants as soon as the symptoms are observed is recommended.

MULFORD (F. L.) & WEISS (F.). **Culture and diseases of Delphiniums.**—*Fmrs' Bull. U.S. Dep. Agric.* 1827, 12 pp., 3 figs., 1 map, 1939. [Received May, 1940.]

In this semi-popular pamphlet on the cultivation of annual and perennial *Delphinium* spp., it is stated that failures more often result from unfavourable cultural conditions than from parasitic organisms. Probably the most prevalent disease, especially of the perennials, is root rot, a symptom complex which includes death and decay of the roots and the basal part of the stem, sometimes followed by a loss or change of colour, wilting, or a general blight of the aerial parts of the plant. Cultural defects greatly promote the development of root rot, the most common being too warm an exposure, resulting in excessively high soil temperature, deficient soil moisture, and a tendency in clay soils to become crusty and compact, and a heavy type of soil that is not worked deeply enough. Contact of the crowns with stable manure may also induce root rot. If the cultural requirements of the species are not satisfied, root rot may develop even in absence of aggressive fungous parasites, but, on the other hand, plants grown under relatively ideal conditions may be attacked by certain parasites. The most common in the eastern States south of Pennsylvania is *Sclerotium rolfsii*, the form known as *S. delphinii* [*R.A.M.*, xiv, p. 147] occurring in then orthern part of this region. *S. rolfsii* causes sudden dying of one or more shoots and the decay of the crown and roots of both annual and perennial sorts. The fungus can persist in the soil for an indefinite period on live or dead vegetable matter. Soil disinfection with formalin, naphthalene flakes (8 oz. per sq. yd. dug well into the soil), or mercurous chloride (1 oz. per sq. yd.) is recommended. *Rhizoctonia* can also cause root rot, but may ordinarily be avoided by providing favourable cultural conditions. Other diseases mentioned are several bacterial troubles including leaf spot caused by *Bacterium delphinii* [ibid., xvii, p. 823]; mildew (*Erysiphe polygoni*) [ibid., xvi, p. 320]; a blight of annual species only (*Diaporthe arctii*) [ibid., x, p. 385]; virus diseases including stunt [ibid., xiii, p. 638] and those belonging to the group of cucumber mosaic viruses [ibid., xii, p. 473]; and damping-off of seedlings, against which treatment of soil with some formaldehyde dust prior to sowing is recommended.

TRENT (J. A.). **The status of Cylindrosporium chrysanthemi E. and D., as the causative agent of Chrysanthemum leaf blight.**—*Trans. Kans. Acad. Sci.*, xlii, pp. 203–204, 5 figs., 1939.

The examination of fixed and stained specimens of *Chrysanthemum* leaf blight from various parts of the United States and Ontario revealed subepidermal pycnidia, 85 to 175 μ in diameter, some provided with a short beak and having ostioles through which escape the straight or slightly curved, fusiform, granular, obscurely septate conidia, 30 to 70 by 1 to 2·5 μ. These dimensions agree with those reported by Ellis and Dearness for the acervuli of *Cylindrosporium chrysanthemi* [*R.A.M.*, xi, p. 224], but differ markedly in respect of conidial measurements. It is concluded that the fungus in question has closer affinities with *Septoria* than with *Cylindrosporium*, and that *C. chrysanthemi* should be regarded as a synonym of *S. chrysanthemi* Cav. (*S. chrysanthemella*

Cav. [Sacc.]) [ibid., xvii, pp. 460, 654] or *S. chrysanthemi* Allesch. [ibid., xvi, p. 797].

SCHMIDT (E.). **Mehltau an Gloxinien.** [Gloxinia mildew.]—*Blumen- u. PflBau ver. Gartenwelt*, xliv, 11, p. 94, 1940.

Downy mildew (*Phytophthora speciosa*) is stated to be responsible for severe and widespread damage to gloxinias [*R.A.M.*, xiv, p. 637] in Switzerland, causing a brown discoloration and softening of the stem, which later extends to the petioles and pedicels; the leaves and buds droop and the plant soon dies. Soil sterilization by means of steaming or with a disinfectant such as uspulun, carbon disulphide, or formalin is the best control measure, supplemented by strict attention to sanitation and the avoidance of an unbalanced nitrogenous fertilizer.

PIRONE (P. P.). **Leaf crinkle of Geranium.**—*Plant Dis. Reptr*, xxiv, 6, pp. 129–131, 1940. [Mimeographed.]

Over 400 geraniums [*Pelargonium*], mostly of the Olympic Red variety, were found in one New Jersey greenhouse in 1938 to be affected by crinkle [*R.A.M.*, xviii, p. 442]. Observations in the same year on varietal reaction to the disease denoted comparative resistance in Improved Ricard and Poitevine and immunity in the white types. In 1940 Salmon Supreme was also found to be very susceptible, while Appleblossom and White Buchner showed a high degree of resistance. Thrips were suspected of transmitting the virus from the recently introduced Salmon Supreme to Olympic Red, which, as in 1938, was again heavily infected. In addition to insects, diseased cuttings serve as a source of perpetuation of crinkle, the great difficulty in the control of which lies in the complete masking of the symptoms, simulating recovery, during the summer months. Cuttings taken from masked plants in the early winter do not develop the typical symptoms of the disease until they are six to eight weeks old.

RAY (W. W.). **A new Cercospora from Oklahoma.**—*Mycologia*, xxxii, 2, p. 271, 1940.

A description [with a Latin diagnosis] is given of a new species, *Cercospora laburni*, collected on leaves of *Laburnum anagyroides* [= *L. vulgare*] at Stillwater, Oklahoma. The fungus causes a serious leaf spot, the subcircular to angular lesions having a grey to white centre with a dark reddish-brown, narrow margin, and measuring 1 to 8 mm. in length. The stroma is slight to 50 μ in width; the conidiophores are dark in mass, pale olivaceous-brown singly, uniform in colour and width, sparsely septate, not branched, and measure 4 to 6 by 20 to 125 μ; and the conidia are hyaline, acicular, straight to slightly curved, with indistinct septa, truncate at the base, and measure 2 to 3·5 by 20 to 110 μ.

CLEMENTE (G.). **Infezioni epidemiche di un' Alternaria tipo dianthi su semenzai di Garofano.** [Epidemic infections of an *Alternaria* of the *dianthi* type on Carnation seedlings.]—*Riv. Pat. veg.*, xxx, 3–4, pp. 97–115, 1940.

In 1937 and 1938 valuable carnation seedlings in a nursery at San Remo became affected by a condition in which the hypocotyl turned

brown and became girdled, causing the collapse and death of the seedlings within 4 to 8 days. The affected material showed the presence of a fungus resembling *Alternaria dianthi*, but with ochraceous conidiophores. The ochraceous conidia had a well-developed foot [beak], measured 20 to 184 by 8 to 20 μ, and had 1 to 12 transverse septa; very occasionally a single longitudinal septum and one or two oblique septa were noted [cf. *R.A.M.*, xix, 349].

Inoculation of seedlings of carnation and *Dianthus barbatus* with mycelium or typical conidia from cultures resulted in 85 per cent. infection by mycelium and only a few plants infected by conidia. Seedlings from disinfected seed were then inoculated with conidia from plants experimentally infected with mycelium; the inoculated seedlings were kept for 24 hours in a saturated atmosphere and subsequently watered at regular intervals. After 22 days every inoculated plant of all carnation varieties tested was infected. Among the plants of *D. barbatus*, 20 per cent. of those inoculated with mycelium and 50 per cent. of those inoculated with conidia became infected in 22 days. No infection developed in any of the uninoculated controls.

The paper concludes with general recommendations for preventive treatment of the seedlings by cultural practices designed to increase resistance, frequent spraying with a mercury fungicide (0·1 to 0·2 per cent.), the removal of diseased plants, soil sterilization, and the disinfection of all appliances and containers with formalin.

NEILL (J. C.). **The endophyte of Rye-Grass (Lolium perenne).**—*N.Z. J. Sci. Tech.*, A, xxi, 5, pp. 280–291, 9 figs., 1940.

An account is given of the author's studies (forming part of a co-operative inquiry into a serious disease of livestock tentatively attributed to the ingestion of a herbage toxin) at the Plant Research Bureau, Department of Scientific and Industrial Research (New Zealand), on an endophytic fungus of perennial rye grass (*Lolium perenne*). In 1939 the organism was found to be present in 100 per cent. of the leaves of *L. perenne* (certified) plants of the current year's harvest, in 53 per cent. of those of 1938, in 23 per cent. of 'false' perennial (probably largely hybrid), and in none of the Italian rye grass [*L. italicum*] examined. In contrast to the figures for certified material, ordinary commercial rye grass in South Island was found to be partially or entirely free from the fungus. In an examination of plants raised from seed sown at varying ages, the incidence of infection in *L. perenne* decreased from 15 out of 15 at 3 to 4 months to 8 out of 15 at $1\frac{1}{4}$ years and to nil at $2\frac{1}{4}$ years and upwards: *L. multiflorum* from 3 to 4 months' old seed was free from the endophyte. The inspection of five hybrids between *L. perenne* and *L. multiflorum* revealed the presence of the endophyte as follows: 0 out of 10 in AB 2, 9 out of 10 in AB 3, 23 out of 28 in AB 4, 6 out of 6 in AB 5, and 6 out of 6 in AB 6. The interpretation of these data presents certain difficulties in the light of Miss Sampson's statement that infection is mechanically inherited from the female parent only [*R.A.M.*, xix, p. 224]; possibly some genetic factor for resistance may operate to produce the uninfected plants in some of the hybrids. In the case of AB 2 the endophyte was found to be present in the female but not in the male parent.

L. perenne plants free from the endophyte remained uninfected for at least two years in the open field. The fungus was not detected in a number of other common pasture grasses.

Within the foliar tissues, stained with lactic acid and aniline blue, the endophyte appears as a series of parallel hyphae, 1 to 2 μ in diameter (average 1·5 μ), with well-defined, non-staining, intercellular, sparsely branching hyphae, without haustoria, two adjacent hyphae sometimes being joined by a connecting filament with or without accessory structures. In the outer leaf sheaths the hyphae tend to become sinuous and folded. All the aerial parts of an infected plant appear to contain endophytic hyphae, which are, however, difficult to detect in very young tissues and in the chlorophyll-bearing leaf blades. In the mature seed the hyphae form a loose tangle in the crushed nucellar tissues overlying the aleurone layer, and a few can be traced in the embryonic tissues among the cells of the scutellum and base of the plumule, while a proliferation of interlacing hyphae forms an almost continuous layer upon the epithelium of the scutellum in contact with, but not penetrating, the adjacent endosperm cells.

Among the fungi isolated from surface-sterilized leaf tissues were *Colletotrichum gloeosporioides*, *C. graminicola*, and species of *Alternaria*, *Cladosporium*, and *Fusarium*. The endophyte itself was cultured on a number of standard media. Anaerobic conditions appear to be requisite for the primary growth of the endophyte outside the host. On potato dextrose agar the slowly growing colonies somewhat resemble the initial stages of sclerotium formation in a *Sclerotinia*. The fungus grew more vigorously on carrot and potato plugs than on the agar media. Cultures of identical appearance were secured by this method from over 90 per cent. of infected seedlings from three lines of certified perennial, whereas 70 endophyte-free seedlings of line 32–I yielded no growth.

Attempts to eliminate the fungus by a direct hot-water dip (10 minutes at 134° F.) gave negative results, but a reduction in the percentage of infection from 100 to from 0 to 80 in five certified lines of the 1939 harvest was obtained by pre-soaking for six hours at 55°, followed by 10 minutes at 128°.

LUDBROOK (W. V.). **Occurrence of Sclerotinia minor Jagger on a bowling green.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 51–53, 1940.

The author records that a fungus agreeing in most respects with *Sclerotinia minor* [see below, p. 508] was observed at Canberra on a bowling green infested with water-weed (*Hydrocotyle* sp.), the foliage of which developed infection, especially when air and soil temperatures were about 60° to 75° F., and when heavy dews occurred. The individual patches were about 9 in. in diameter, but sometimes coalesced into areas of several square feet. The advancing edge was irregular and under humid conditions bounded by a greyish-white to buff zone about 1 cm. wide, formed by the aerial hyphae. To a distance of 1 cm. or more within this zone, the soil was covered by a slimy film made by the collapsed leaves and hyphae. Under favourable conditions, sclerotia formed as the film dried.

Temporary control resulted from treatment with mercuric chloride with and without mercurous chloride; applications must be made about

a week before an outbreak is expected, and be repeated at intervals of two or three weeks if conditions remain favourable to infection.

The optimum temperature for growth of the fungus on potato dextrose agar was 20° C. Sclerotia produced in culture were germinated by Dr. W. D. Waterhouse by placing them on wet cotton-wool in a Petri dish. The first sign of germination was observed after about three months and the first apothecium four months later. A comparison of the author's measurements of asci (means of 152·8 by 11·6 μ) and ascospores (14·26 by 7·79 μ) with those recorded by Keay for *S. minor* [*R.A.M.*, xviii, p. 628] showed good agreement. Hyaline, globose microconidia, 3 to 4 μ in diameter, developed on the surface of the upper quarter of the stalks of some of the apothecia, giving them a frosted appearance.

MILLER (E. V.) & SCHOMER (H. A.). **A physiological study of soft scald in Jonathan Apples.**—*J. agric. Res.*, lx, 3, pp. 183–192, 1 graph, 1940.

In a study carried out in Virginia from 1933 to 1935, Jonathan apples were stored under conditions known to induce soft scald [*R.A.M.*, xiv, p. 41], e.g., at 32° and 36° F. either immediately or following a delay for 3 to 11 days at 65° to 75°, and subjected to heating or to carbon dioxide treatment following delay and prior to storage. Physiological analyses showed that fruit samples stored immediately exhibited a gradual but slight increase in acetaldehyde content, while a delay greatly increased the amount of this substance during the early part of the storage period, and treatment with carbon dioxide following the delay produced the highest acetaldehyde content of all samples. Further data are given on the sucrose and acid contents of similarly treated fruit. The authors failed to find, however, any correlation between the sugar, acid, and acetaldehyde contents and the occurrence of soft scald.

KAESS (G.). **Kältetechnische Zusatzverfahren für die Frischhaltung von Lebensmitteln und die Aussichten ihrer praktischen Anwendung.** [Improved refrigerative technique for the preservation of foodstuffs and the prospects of its practical application.]—*Naturwissenschaften*, xxviii, 7, pp. 103–109, 1 fig., 1 diag., 3 graphs, 1940.

This is a useful review of the present status of refrigerative technique for the preservation of foodstuffs against microbial infection by means of such recent improvements as storage in a carbon dioxide-containing atmosphere, the introduction of ozone [*R.A.M.*, xvii, p. 686] into storage rooms, treatment, e.g., of apples, with oil emulsions (of which 5 per cent. of the commercial preparation olea is stated to be effective [? against *Gloeosporium album*: ibid., xviii, p. 533] in Beauty of Boskoop and Baumann's Pippin), irradiation [ibid., xvii, p. 418], and the use of wrappers treated with chemical disinfectants.

MITTMANN-MAIER (GERTRUD). **Untersuchungen über die Monilia-resistenz von Sauerkirschen.** [Studies on the resistance of sour cherries to *Monilia*.]—*Z. PflKrankh.*, l, 2, pp. 84–95, 1 fig., 1940.

In inoculation experiments at the Geisenheim (Rhine) Experiment Station in which conidial suspensions of *Monilia cinerea* [*Sclerotinia*

laxa] and *M*. [*S*.] *fructigena* from malt agar cultures were introduced through wounds into the branches of sour cherries, the most resistant varieties were Haarlem and Empress Eugénie (semi-sweet) and Grosser Gobet, the percentages of infection on which were 30, 27, and 33, respectively, as compared, e.g., with 95, 95, and 94 per cent., respectively, in Shade Morello, Ostheimer Weichsel, and Doppelte Natte [*R.A.M.*, xviii, p. 603]. Schmidt's observation to the effect that extensive gummosis is a concomitant of mild wilting and vice versa [see also loc. cit.] was confirmed by these experiments, the results of which indicated that a heavy flow of gum following branch infection is a supplementary diagnostic character of resistance to *Sclerotinia*.

The inoculations were carried out with a strain each of *S. laxa* from sour cherry, apricot, and peach, and with two of *S. fructigena* from apple. Regarding the nomenclature of *M. cinerea*, the writer takes cognizance of the decision of the British Mycological Society's Plant Pathology Committee, following T. H. Harrison, to adopt *S. laxa* for this species [ibid., xiv, p. 703], but prefers to retain *M. cinerea* for the German material pending a more intensive study of the taxonomy of the fungus in relation to environmental conditions. The strains of different origin showed corresponding divergences in culture. Thus, the sour cherry strain of *S. laxa* produced concentric zones of alternating light and dark coloration, the periphery and centre being invariably pale as was also the sparse aerial mycelium. The general aspect of the apricot strain of *S. laxa* was much lighter than the foregoing, the few dark areas being covered with a white or yellowish mycelium. Zones were formed in much the same manner as in the sour cherry strain. The relatively slow-growing peach strain of *S. laxa* was characterized by a few, narrow, concentric rings of pale yellow mycelium in the centre, surrounded by a darker zone with white rays, the periphery being pale and describing an almost perfect circle in contrast to the very sinuous margins of the other strains. Of the two strains of *S. fructigena*, that from Munich formed well-marked, pale yellow concentric zones, which were inconspicuous in the Pillnitz culture. The three strains of *S. laxa* were about equally pathogenic to cherry branches, the number killed ranging from 54 to 61 per cent. and those remaining externally sound but exuding gum from 10 to 12 per cent. *S. fructigena* was considerably weaker in its action, destroying only 26 to 35 per cent. of the infected branches and inducing gummosis in 25 to 34 per cent. Blossom infections gave positive results as follows: sour cherry, apricot, and peach strains of *S. laxa*, 58, 67, and 44 per cent., respectively; *S. fructigena* (Pillnitz) 35 per cent., and the same (Munich) nil.

Blodgett (E. C.). **A leaf spot of Italian Prune perpetuated in budded stock.**—*Phytopathology*, xxx, 4, pp. 347–348, 1 fig., 1940.

During the last few years the writer has observed a varying incidence of leaf spot and defoliation among Italian prunes in Idaho, the trouble being particularly severe in 1936. The lesions range from 1 or 2 mm. in diameter to large blotches and irregular necrotic areas, and may be accompanied by shot hole and indistinct mottling. Buds from diseased prune trees were set on healthy J. H. Hale and Elberta peaches in 1938

and the prune shoots developed severe leaf spot and chlorosis during the following summer. No parasitic fungus has been isolated from the diseased tissues, and the disturbance is tentatively attributed to a virus or genetic abnormality, though environmental factors (e.g., the vicinity of live stock) are believed to play an important part in its occurrence.

CHEAL (W. F.). **A difficult Strawberry problem in the Isle of Ely.**—*Gdnrs' Chron.*, cvii, 2775, pp. 107–108, 1 fig., 1 map (on p. 106), 1940.

In determining the rôle of yellow edge in the recent decline in strawberry production in the Isle of Ely, involving a reduction from 6 tons to barely 1 ton per acre, the author in 1937 obtained from the East Malling Research Station about 2,000 Royal Sovereigns virtually free from the disease [*R.A.M.*, xviii, p. 326], which were divided into four lots and planted in early winter as follows: (1) at Wisbech in good silt soil close to other strawberry fields; (2) at Little Downham on good, rather gravelly soil, about 300 yds. from other strawberry fields; (3) at Haddenham on moderately fertile greensand, about 440 yds. from other strawberry fields; and (4) at West Fen, March, on poor, dry, peaty soil, at least a mile in every direction from other strawberry fields. In lots (1) to (3) planting was carried out in squares, a yard apart, the runners being trained into the middle of the squares, while in (4) the plants were situated so far apart that there was scarcely any risk of interlocking runners. In the following September, after an exceptionally dry summer, the percentages of yellow edge in lots (1), (2), (3), and (4) were 41·5, 45·1, 26·9, and 0, respectively, though it should be mentioned that there were a number of suspicious but not authenticated cases of yellow edge in (4), together with extensive crinkle [loc. cit.].

It is apparent from these results that the planting of expensive, disease-free stocks of strawberries in established growing centres is an unwise procedure in the present stage of knowledge concerning the control of the insect vector. In these tests aphids, including *Capitophorus fragariae*, were abundant in all the lots except (4), attempts at their control being made only in (1). Apart from Royal Sovereign, all the other varieties cultivated locally either withstood the disease or carried it in a masked form.

ENDO (Y.). **Researches on Mulberry virosis.**—*Bull. Seric. Silk Industr., Uyeda*, xi, 4, pp. 203–218, 20 figs., 1939. [Abs. in *Biol. Abstr.*, xiv, 4, p. 704, 1940.]

Mulberry virosis is reported to be spreading in twelve prefectures in Japan [*R.A.M.*, xvii, p. 538] by means of grafting and the planting of diseased seedlings. Methylene blue is reduced by juice expressed from the leaves. The infective principle is stated to retain its virulence for nine years in desiccated foliage.

MAGEE (C. J. P.). **Transmission of infectious chlorosis or heart-rot of the Banana and its relationship to Cucumber mosaic.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 44–47, 2 figs., 1940.

In further studies on banana infectious chlorosis or heart rot in Australia [*R.A.M.*, xii, p. 201] transmission was obtained with *Macrosiphum*

gei, *Aphis gossypii*, and an unidentified aphid, and evidence was obtained that *Pentalonia nigronervosa* is only a capricious vector, unlikely to be important under natural conditions. Using *A. gossypii* as vector, the virus was transmitted from the Cavendish banana to *Musa ensete* and to a seeded *Musa* of undetermined species. From the last-named it was transmitted by *A. gossypii* to Cavendish and Gros Michel bananas, abacá (*M. textilis*), *Canna indica*, cucumber, squash, and tomato. It was readily transmitted by mechanical inoculation from cucumber and squash to cucumber, squash, and tobacco, and from tobacco to cucumber, squash, and the seeded *Musa*.

In tobacco, cucumber, and squash, the virus produces symptoms characteristic of *Cucumis* virus 1 [cucumber virus 1: ibid., xviii, p. 182]; the fern-leaf symptom develops when the virus is transmitted by *A. gossypii* to tomato. The author considers that the virus is, in fact, a strain of cucumber virus 1.

Collections made at random in different parts of New South Wales of cucumber, squash, tomato, and beet foliage, all showing mosaic symptoms, were tested by inoculation of young seedlings of the undetermined species of *Musa*, and in all cases symptoms identical with those produced by the virus of infectious chlorosis resulted.

Outbreaks are likely only in areas where vegetables are grown near bananas in the early stages of the establishment of a plantation. Cucumber virus 1 does not appear to be endemic in any part of New South Wales where bananas are grown. Common plantation weeds may become infected, and the following were found with mosaic-like symptoms in a plantation in which infectious chlorosis was spreading: *Solanum nigrum*, *S. verbascifolium*, *S. seaforthianum*, *Phytolacca octandra*, *Homalanthus populifolius* [*H. leschenaultianus*], *Passiflora alba*, *Physalis peruviana*, and *Bryanopsis laciniosa*. These weeds occurred in circumstances strongly suggesting the presence of a single virus, the identity of which was demonstrated in the case of the interplanted crop of Marglobe tomato plants showing fern-leaf mosaic.

If cucumber virus 1 and Wellman's celery virus 1 are to be regarded as identical, the symptoms described by Wellman on banana [ibid., xiv, p. 112] are those of infectious chlorosis. Abacá mosaic in the Philippines [ibid., xviii, p. 801] is also probably due to cucumber virus 1. That Cavendish banana plants affected with infectious chlorosis are susceptible to the bunchy top virus indicates that the two viruses belong to different immunological groups.

CARTER (W.). **Populations of Thrips tabaci, with special reference to virus transmission.**—*J. Anim. Ecol.*, viii, 2, pp. 261–276, 1 pl., 4 graphs, 1939.

Observations in Hawaii showed that the percentage of *Emilia sonchifolia* plants attacked by yellow spot [tomato spotted wilt: *R.A.M.*, xviii, p. 657; xix, p. 355, above, p. 460, and next abstracts], was correlated closely with the percentage infested by *Thrips tabaci*, indicating that once the thrips is established on an *Emilia* plant it does not move readily from it. Data were also obtained that a considerable reservoir of virus may exist in the pineapple fields with little or no transference to pineapple plants taking place. Infestation of pineapple occurs during

blossoming and this transient stay is sufficient to infect the pineapple if the insect is viruliferous and the pineapple susceptible. There was no evidence of movement of *T. tabaci* from pineapple to pineapple or from undisturbed *E. sonchifolia* to pineapple. It is believed that, even in the presence of high populations of *T. tabaci* per unit of *Emilia*, the yellow spot disease can only assume economic proportions if factors governing dispersal of the thrips (possibly cultivation of the host plant areas or drought) are operating at the exact time when pineapple plants pass through their period of susceptibility.

SAKIMURA (K.). **Evidence for the identity of the yellow-spot virus with the spotted-wilt virus : experiments with the vector, Thrips tabaci.** —*Phytopathology*, xxx, 4, pp. 282–299, 4 figs., 1940.

Evidence is presented in support of the author's view that the Hawaiian pineapple yellow spot virus is identical with the tomato spotted wilt virus [see preceding abstract]. The virus, originally derived from *Emilia sonchifolia*, was transmitted by *Thrips tabaci* to, and recovered from, a large number of species of plants, all hosts of the spotted wilt virus. The inoculated plants developed symptoms identical with those of spotted wilt after incubation periods of similar duration. Beet, chard [*Beta vulgaris* var. *cicla*], cabbage [ibid., xvi, p. 502], and New Zealand spinach (*Tetragonia expansa*), previously reported to be immune from spotted wilt, likewise remained unaffected by the pineapple yellow spot virus in the writer's trials.

These data are considered to furnish convincing evidence of the identity of the spotted wilt and yellow spot viruses.

PARRIS (G. K.). **Mechanical transmission of yellow-spot virus : evidence for identity with spotted-wilt virus.**—*Phytopathology*, xxx, 4, pp. 299–312, 8 figs., 1940.

In 1937 tomatoes in Hawaii were observed to be suffering from a disorder closely resembling spotted wilt, except that bronzing was not a conspicuous symptom. The virus responsible for the condition does not appear to be seed-borne, but is readily transmitted by mechanical means from tomato to the same host and potato, and from *Emilia sonchifolia* to the same and tomato. Experiments in the mechanical transmission of the disease from tomato to *E. sonchifolia*, lettuce, garden peas, and bell pepper (*Capsicum annuum* [var. *grossum*]) gave negative results, but the virus was conveyed by grafting from tomato to the same host and potato and vice versa. The symptoms induced by artificial inoculation of tomatoes in the greenhouse are identical with those observed under natural conditions in the field, and further resemble those obtained by Linford by the introduction into tomatoes of the pineapple yellow spot virus with the aid of its insect vector, *Thrips tabaci*. Potatoes infected by the tomato virus develop symptoms corresponding exactly with those described by Magee as typical of spotted wilt in Australia [*R.A.M.*, xv, p. 538]. In the case of *E. sonchifolia* also the symptoms resembled those developing on field plants naturally infected by the pineapple yellow spot in Hawaii and (according to Whipple) by spotted wilt in Wisconsin [ibid., xvi, p. 134].

The Hawaiian tomato (yellow spot) virus is easily recoverable from

diseased fruits in an unripe condition but not at maturity, a characteristic observed by Samuel and collaborators in connexion with spotted wilt in Australia [ibid., x, p. 65].

Although the physical properties of the two viruses have not yet been compared, all the evidence at present available points to the identity of pineapple yellow spot and spotted wilt viruses [see preceding abstract].

Thomas (H. Earl), Rawlins (T. E.), & Parker (K. G.). **A transmissible leaf-casting yellows of Peach.**—*Phytopathology*, xxx, 4, pp. 322–328, 2 figs., 1940.

In 1932, a yellows of Early Crawford, Elberta, Fay Elberta, Muir, and Orange Cling peaches similar to, if not identical with, the 'X' disease of the north-eastern States [*R.A.M.*, xix, p. 292], was first observed in California, and since that date there is evidence of appreciable spread; in one orchard, for instance, where 37 out of 117 trees were affected in August, 1936, 49 had contracted the disease by mid-July, 1939.

In the Green Valley (Solano County) area, where most of the records have been taken, the only tangible early-season feature of the disorder is a slight delay in the flowering time of the diseased trees, but from late June onwards until the end of August more specific symptoms become apparent. Irregular areas of the leaf blade turn pale green to yellow and assume a brittle texture, soon separating from the rest of the leaf. The diseased leaves gradually develop a uniform greenish-yellow cast, rolling upwards, and being shed one by one, beginning with the oldest. Defoliation is accompanied by the shrivelling and dropping of the fruits.

The leaf-casting disease was first noticed in a block adjoining an orchard in which cherries were severely affected by buckskin [ibid., xiv, p. 111], and similar associations were subsequently observed in four localities in two counties. Inoculation of peach trees with cherry scions from buckskin-diseased trees resulted after considerable delay in the typical peach symptoms in 4 out of 7 and 8 out of 20 trees, whereas all the control trees remained healthy. Inconclusive results, however, were given by grafting from cherries to peaches and vice versa, so that the exact nature of the relationship remains obscure. Four out of seven trees of *Prunus demissa* inoculated with buckskin by grafting developed a conspicuous carmine coloration of the lower leaves suggestive of the reddening of the same host due to X disease. The number of infections resulting from grafting peach to peach has been consistently low. The Orange Cling seems to provide the most effective inoculum of the varieties tested, while shoots are in general more successful than roots for the purpose in view.

Richards (M. C.). **A soft rot of Apples caused by Trichoseptoria fructigena.**—*Phytopathology*, xxx, 4, pp. 328–334, 3 figs., 1940.

Trichoseptoria fructigena, originally recorded by Maublanc as attacking apple and quince fruits in France (*Bull. Soc. Myc. Fr.*, xxi, 95–97, 1905), was isolated on potato dextrose agar and by pouring dilution plates from two McIntosh apples collected by H. H. Whetzel at Cornell University, New York, this being apparently the first mention of the

fungus in North America. The fruits exhibited well-marked soft rot lesions of a vinaceous-fawn colour, glossy, and sunken, partially covered with black, slightly erumpent pycnidia.

In order to secure satisfactory growth in culture it was necessary to add dextrose at concentrations of 1, 2, or 5 per cent., which resulted in the development in ten days at room temperature (the optimum for growth being about 21° C.) of thick, black mycelial mats, composed of submerged hyphae which are dark green, later black, and grey aerial hyphae. The most abundant pycnidial production occurred at lower temperatures (up to 18°). In inoculation tests with mycelium inserted through notches on the fruits of 25 apple varieties the fungus induced on the red sorts a vinaceous-fawn discoloration and waxy consistency of the skin, while the yellow and green assumed ochraceous-buff and Dresden brown tints, respectively, accompanied by dullness of the skin. Erumpent pycnidia developed chiefly on the thick-skinned, moisture-retaining late autumn and winter varieties. In culture the erumpent pycnidia are covered with greyish hairs which are absent in nature. Infection of McIntosh in moist chambers at 15° was also secured by spraying the unwounded surfaces with conidial suspensions of *T. fructigena*. The disease was further communicated from rotted to sound apples by contact in storage.

The pycnidial and conidial dimensions of the New York collection agreed closely with those given by Maublanc, the conidia measuring 17 to 23·8 by 2·3 to 3·4 μ but the liberated spores were for the most part straight and pointed at the basal end, and non-septate (indistinctly biseptate in the French ones), and the conidiophores were much more complex than Maublanc's description or figures would suggest. These minor variations, however, are not considered to constitute an essential specific difference.

MARTIN (H.). **The scientific principles of plant protection with special reference to control. Third Edn.**—x+385 pp., London, E. Arnold & Co., 1940. 22*s*. 6*d*.

The incorporation in the third edition of this useful manual of a discussion of the many new developments in the science of plant protection during the last four years through the control of pests and diseases [*R.A.M.*, xv, p. 594] necessitated a drastic pruning of the text involving the re-setting of the book. Among the subjects in which the advance has been most evident are the nature and control of virus diseases, the epidemiological features determining the degree of severity of an attack, and the adaptation to practical requirements of judgements formed in the laboratory on the qualities contributing to insecticidal and fungicidal efficiency [ibid., xix, p. 420].

BACHE-WIIG (SARA). **Contributions to the life history of a systemic fungous parasite, Cryptomycina pteridis.**—*Mycologia*, xxxii, 2, pp. 214–250, 27 figs., 1940.

A leaf roll disease of bracken caused by *Cryptomycina pteridis* and characterized by curling and stiffness of the pinnules of young fronds, yellowish-green discoloration, and the formation of brown spots and abundant black stromatic areas on the lower surface of the pinnules

between the veinlets, is stated to be widespread in America and Europe and to occur also in northern Asia. Conidial fructifications are formed during the growing season, and stromata in which the asci mature in the following spring. A study of the pathogen in relation to the eastern bracken, *Pteridium latiusculum*, is reported in some detail and infection is shown to be systemic and perennial, the fungus overwintering in rhizomes and frond buds. Infection of the maturing rhizome is confined to limited areas where its cells apparently soon die, but in the developing frond the fungus grows luxuriantly. In inoculation experiments with conidia, systemic infection and typical leaf roll symptoms resulted only from inoculation of young bracken sporophytes; localized infection followed the inoculation of young fronds or immature portions of older ones, and of the underground parts of mature plants.

Brooks (F. T.). **Some recent investigations on epidemic plant diseases.** —*Rep. Aust. Ass. Adv. Sci.*, xxiv, pp. 290–299, 1939.

The author discusses the relations of parasites to their host plants, especially from the standpoint of the establishment of disease in epidemic form, and deals with the influence of one parasite on the incidence of another. He suggests that some plant diseases are due to complexes of micro-organisms and incidentally points out that in the so-called 'watermark' disease of *Salix caerulea* in eastern England it has been found that even in naturally occurring early infections *Bacterium salicis* [*R.A.M.*, xvii, p. 356] is invariably accompanied by two other species of bacteria which are responsible for some of the histological symptoms.

Piper (C. S.). **The symptoms and diagnosis of minor-element deficiencies in agricultural and horticultural crops. Pt. I. Diagnostic methods. Boron. Manganese.**—*Emp. J. exp. Agric.*, viii, 30, pp. 85–96, 1940.

This is a critical discussion of some outstanding recent contributions to the diagnosis of plant diseases associated with boron and manganese deficiency, reference to most of which has been made from time to time in this *Review*.

Chupp (C.). **Further notes on double cover-glass mounts.**—*Mycologia*, xxxii, 2, pp. 269–270, 1940.

The following double cover glass mount, based on W. W. Diel's method (*Science*, N.S., lxix, p. 276, 1929), has been used with excellent results for mounting *Cercospora*, *Meliola*, and *Venturia inaequalis*. On the smaller of the two cover glasses used (one 22 or 18 mm. and one 12 mm.), the material, e.g., fungi, algae, or sections and bits of host tissue, is placed in a drop of Shear's mounting fluid which consists of 300 c.c. 2 per cent. potassium acetate (in water), 120 c.c. glycerine, and 180 c.c. 95 per cent. alcohol. The mount is heated over a microburner until most of the liquid is evaporated, then a drop of glycerine is added and the mount is slightly heated again. The cover glass with the material and the heated glycerine is then inverted, pressed down firmly on the larger cover glass, and all excess glycerine wiped off. The two glasses, the smaller one underneath, are next placed on a microscope slide on which a drop of medium-heavy balsam has been gently

heated, and the whole mount pressed down as the balsam spreads and seals the glycerine.

KROGH (A.). **A micro-climate recorder.**—*Ecology*, xxi, 2, pp. 275–278, 5 diags., 1940.

Full details are given of the construction and application of a micro-climate recorder combining the principles of Weickmann's pocket thermohygrograph (*Ber. Sächs. Akad. Wiss.*, lxxxix, 1938) with those of meteorological micro-recorders, and adaptable to the study of a wide range of scientific problems involving an exact knowledge of the prevailing temperature and humidity relations.

WENT (F. W.). **Local and generalized defense reactions in plants and animals. Local reactions in plants.**—*Amer. Nat.*, lxxiv, 751, pp. 107–116, 1940.

In this paper (read at a joint meeting of five American societies at Columbus, Ohio, on 30th December, 1939) the author discusses local reactions of plants to parasitic attack from the standpoint of the host. These responses range from the death of the cell to greatly increased growth and the development of apparently new forms. In all cases, however, the new formations are within the potential range of development of the host, and in certain simple cases the new forms have been induced by chemically known substances. The effect of parasitic attack is to bring out potentialities, rearrange tissues, and develop new growth patterns.

PRICE (W. C.). **Generalized defense reactions in plants.**—*Amer. Nat.*, lxxiv, 751, pp. 117–128, 1940.

In this paper (read at the same meeting as the preceding), the author reviews and discusses the available evidence for the existence of acquired immunity to virus diseases in plants. Conclusive data show that plants affected with certain virus diseases develop a defence reaction beyond the natural immunity inherent in the plant. Plants may recover from some virus diseases, and become resistant to reinfection. The ensuing immunity is of the carrier type, since the plant continues to harbour the virus. Further, plant cells infected with one strain of a virus appear to become immune from infection by related strains. In such cases, immunity is generally of the chronic-disease type, the plants losing neither the virus nor the symptoms produced by it. In both types of immunity the nature of the defence mechanism is unknown.

KAUSCHE (G. A.). **Über den Mechanismus der Goldsolreaktion beim Protein des Tabakmosaik- und Kartoffel-X-Virus.** [On the mechanism of the gold sol reaction of the Tobacco mosaic and Potato X virus.]—*Biol. Zbl.*, lx, 3–4, pp. 179–199, 9 figs., 1 graph, 1940.

This is a further explanatory account of the mechanism of the differential gold sol reactions of the tobacco mosaic and potato X viruses [*R.A.M.*, xviii, p. 543]. The experimentally established absorption and fixation of gold by these virus proteins has been shown not to impair their infectivity towards *Datura stramonium* and tobacco, respectively.

Adati (M.). **Untersuchungen über die Rhizosphäre der Pflanzen. Zweiter Bericht. Über die Einflüsse der verschiedenen Kulturpflanzen auf die Mikrobenzahl der verschiedenen Bodenarten in Formosa.** [Studies on the rhizosphere of plants. Second report. On the influence of various cultivated plants on the incidence of micro-organisms in the different Formosan soil types.]—*J. Soc. trop. Agric. Taiwan*, xi, pp. 57–65, 1939.

In the writer's studies on the influence of various economic crops on the incidence of the microflora in four types of soil in Formosa, the difference between the numbers in rhizospheres I and II (remote and immediate surroundings of the roots, respectively [cf. *R.A.M.*, xix, p. 422]), was greatest in sand and least in humus, loam and clay being intermediate in this respect. The influence of cereals on the development of soil micro-organisms was generally more powerful than that of legumes. To cite some figures from the tables, the number of moulds in rhizospheres I and II in sandy soil under wheat were 260,000 and 1,500,000 per gm., respectively, the corresponding figures for humus being 60,000 and 710,000, respectively; soy-beans: sand I and II, 170,000 and 4,350,000; humus I and II, 190,000 and 2,310,000; peas: sand I and II, 170,000 and 950,000; humus I and II, 310,000 and 1,200,000; flax: sand I and II, 110,000 and 1,600,000; humus I and II, 130,000 and 1,510,000; and tomatoes: sand I and II, 90,000 and 930,000; humus I and II, 230,000 and 2,080,000.

Young (H. E.). **Mycorrhizae and growth of Pinus and Araucaria. The influence of different species of mycorrhiza-forming fungi on seedling growth.**—*J. Aust. Inst. agric. Sci.*, vi, 1, pp. 21–25, 1940.

To ascertain whether some mycorrhiza-forming fungi might have a more favourable effect on the growth of *Pinus* than others under the conditions prevailing in Queensland [*R.A.M.*, xviii, p. 406], boxes of soil were sown with seed of *P. caribaea* and later inoculated with cultures of *Boletus viscidus*, *B. scaber*, *B. luteus*, *B. bovinus*, *B. elegans*, and *Russula* sp. obtained from Holland, and *B.* (?) *granulatus* from Java. A control box was inoculated with mycorrhiza found under a healthy stand of *P. caribaea*, both *B. granulatus* and *Rhizopogon roseolus* probably being present. Measurements made at the conclusion of the season's growth showed that the mean height of the seedlings inoculated with the fungi in question was, for each fungal species, respectively, 15·23, 14·99, 14·84, 14·82, 14·55, 13·51, and 13·21 in., as compared with 13·07 in. for the control seedlings, the corresponding mean weights being 14·63, 12·95, 11·21, 14·19, 10·79, 9·78, and 12·92 gm., with 9·31 gm. for the controls. It is concluded that different mycorrhiza-forming fungi, as represented by the species tested, may vary greatly in their ability to stimulate growth in one species of tree associate.

In pure culture experiments hoop pine (*Araucaria cunninghamii*) seedlings produced mycorrhiza when grown in association with *B. granulatus* and also with an undetermined fungus constantly isolated from naturally occurring hoop pine mycorrhiza. The latter fungus was similar in culture to and perhaps identical with *B. granulatus*. Hoop pine seedlings failed to develop in pure culture in the absence of a mycorrhizal

fungus. In field experiments the two fungi in question did not produce any different effect on the growth of hoop pine seedlings. In both flask and box experiments the fungi produced endotrophic mycorrhiza with hoop pine; with *Pinus, B. granulatus* produces ectendotrophic mycorrhiza, and it seems that with the *B. granulatus-Pinus* and *B. granulatus-Araucaria* associations the nature of the mycorrhiza depends on a host, rather than a fungus, reaction.

WAGNER (F.). **Die Bedeutung der Kieselsäure für das Wachstum einiger Kulturpflanzen, ihren Nährstoffhaushalt und ihre Anfälligkeit gegen echte Mehltaupilze.** [The importance of silicic acid for the growth of some cultivated plants, their metabolism, and their susceptibility to true mildews.]—*Phytopath. Z.*, xii, 5, pp. 427–479, 15 figs., 1 diag., 3 graphs, 1940.

The writer's extensive laboratory and outdoor experiments at the Bonn Phytopathological Institute confirmed the observations of previous workers as to the beneficial effects of silicic acid on the resistance of certain cultivated plants to mildews. In some instances, in fact, a modicum of the element in the nutrient solution was indispensable to growth, barley plants being practically destroyed at an early stage in its absence by *Erysiphe graminis* [*R.A.M.* xvi, p. 519], whereas those supplied with appropriate amounts showed a high degree of resistance. With oats the results were less clear-cut. Silicic acid also strengthened the resistance of cucumber to mildew [*E. cichoracearum*: ibid., xviii, p. 651] and prolonged the incubation period.

In 6-kg. pot experiments with cucumbers the addition to the soil (marsh) of 20 gm. calcium silicate or 15 gm. sodium silicate lengthened the incubation period and increased resistance to mildew, without, however, entirely controlling the disease. In similar tests with barley the incidence of *E. graminis* was found to stand in direct relation to the soluble silicic acid content of the soil, being much lower in clay and black earth than in quartz sand or marshland. The readily soluble potassium silicate proved slightly superior to the calcium salt for increasing the silicic acid content of the plants and thereby conferring resistance to mildew. Susceptibility to infection was found to increase with rising hydrogen-ion concentration.

In field experiments with summer barley on marshland, humus-sand, and clay, the admixture of silicates increased the assimilation of silicic acid but exercised no appreciable effect on the course of infection by *E. graminis*. It is concluded that the specific use of silicic acid is scarcely justifiable as a general means of mildew control, but that fertilizers containing it should be applied to soils deficient in this constituent.

KÖHLER (E.). **Weitere Studien über die Vira der Y-Gruppe der Kartoffel.** [Further studies on the Potato viruses of the Y group.]—*Phytopath. Z.*, xii, 5, pp. 480–489, 4 figs., 1940.

Continuing his studies on potato viruses [*R.A.M.*, xviii, p. 472], the author investigated two strains of the A group (P 716/17 and P 716/12) and four of the Y type (GA, DJ, Go, and 2A, the first three derived, respectively, from the potato varieties Gustav Adolf, Direktor Johanssen,

and Goldgelbe, and the last-named from the type strain GA). The representatives of the A and Y groups were found to differ in the following respects: *Nicotiana glutinosa* and *Solanum racemigerum* [*S. pimpinellifolium*] are susceptible to Y but immune from A; the thermal death point (ten minutes' exposure) is 58° C. for the Y strains as against 50° for those of A; and infection by the A virus does not protect its hosts against subsequent invasion by Y or conversely, though attack by a weak strain of Y confers resistance to a stronger member of the same group. Other workers have found serological differences between the A and Y strains. The Y antiserum obtained by Stapp and Bercks, for instance (paper of the *Arb. biol. Reichsanst., Berl.*, in the press) was inactive towards the writer's two A strains but agglutinated the Y strain GA.

Skaptason (J. B.), Peterson (L. C.), & Blodgett (F. M.). **The copper content of Long Island soils in relation to tuber rot of Potatoes caused by Phytophthora infestans.**—*Amer. Potato J.*, xvii, 4, pp. 88–92, 1940.

Analyses of Long Island soils used continuously for potato cultivation for periods from 18 to 32 years revealed the presence of large residual quantities of copper (up to one-third of the total amount applied) resultant on the systematic treatment of the crops with Bordeaux mixture for the control of late blight (*Phytophthora infestans*). It is suggested that the virtual inhibition of sporangial germination in the pathogen by the accumulated copper in the soil may account for the very low incidence of tuber rot (as opposed to foliar symptoms) in the local stands despite the almost annual prevalence of temperature and humidity conditions conducive to infection.

Muller (K. O.), Meyer (G.), & Klinkowski (M.). **Physiologisch-genetische Untersuchungen über die Resistenz der Kartoffel gegen Phytophthora infestans.** [Physiologic-genetical studies on Potato resistance to *Phytophthora infestans*.]—*Naturwissenschaften*, xxvii, 46, pp. 765–768, 1 graph, 1939.

In continuation of the first-named author's studies at the Biological Institute, Dahlem, Berlin, on the physiological and hereditary bases of resistance in the potato to late blight (*Phytophthora infestans*) [*R.A.M.*, xvi, p. 53], histological and cytophysiological observations were carried out on the diseased tuber tissues of resistant (W) and susceptible commercial varieties (e.g., Parnassia), with the following results. In the case of susceptible sorts, the parasitized cells (primarily those of the intercellular spaces) undergo five characteristic phases [which are described in detail], culminating in death after a relatively lengthy period (6 to 14 days) at the optimum temperature for the pathogen of 19° C. The process may thus be described as one of necrobiosis in which the cells survive until a comparatively advanced stage. Reaction to *P. infestans* appears to vary even among individual cells of genotypical identity: hence the observed differences in response between tubers and foliage, in which connexion the axiom is established that resistance in the foliage does not necessarily connote the same property in the tubers,

though conversely, resistant tubers inevitably produce the same type of leaves.

Tracing the course of the pathogen through the phases of the disease, the writers found that the 'vitality' of the fungus is adapted to that of the host. Thus, at 19°, sporangia are formed on the third day after inoculation (phases 1 to 2), and by the sixth (1 to 4) the zenith of development, judged by the profusion of fructifications, is already past; from the seventh to the eighth day (4 to 5), when the host cells are largely necrotic, there is practically no further growth of the parasite.

Observations on resistant varieties showed the development of the fungus in the tissues to be very poor, the hyphae extending only for a maximum depth of 20 to 30 cell layers. Sporangia are not formed. Even here, however, a brown discoloration marks the entry of the hyphae after a period of 36 to 48 hours, corresponding to the final phase of infection in the susceptible varieties. The whole difference between resistance and susceptibility to *P. infestans* lies, therefore, in the rapidity of production of the substance toxic to the invader; if the host cell develops this substance quickly the plant is resistant; if slowly, it is susceptible. The function of the genes conferring resistance or susceptibility thus appears in an altogether new light as merely determining the speed of the defensive reactions, and not the presence or absence of the antitoxin. To test the validity of this theory, an experiment was conducted to determine whether the rapidity of growth of the parasite could be sufficiently retarded to enable the host cells to reach the final phase soon enough to check the progress of invasion. This was accomplished by the storage of inoculated Parnassia tubers (after four days at 19°, during which the fungus penetrated 10 to 12 mm. into the tissues) at 0° to 2° for periods of 3 to 21 weeks. By the end of the 15th week the pathogen was no longer in a condition for further advance. The fact that in pure cultures on nutrient agar at 2° the organism survived for considerably longer periods is regarded as definitely pointing to the secretion by the dying or dead host tissues of a substance toxic to its invader, rather than to the direct influence of temperature on the course of infection. The susceptible varieties are thus considered to be inherently capable under appropriate conditions of the same defensive reactions as those induced in the resistant types by the 'resistance genes' ('accelerators'). An analogy with the sex genes, which merely act as carriers in one sex of characters potentially common to both, will readily be apparent.

EDMUNDSON (W. C.) & SCHAAL (L. A.). **Potato breeding for Fusarium resistance.**—*Amer. Potato J.*, xvii, 4, pp. 92–95, 1 fig., 1940.

Promising results in the development of seedling potatoes for resistance to *Fusarium oxysporum* and *F.* [*solani* var.] *eumartii* [*R.A.M.*, xix, p. 360] in Colorado were obtained in 1938–9 with Nos. 2134, 2135, and 47053, which combined relative freedom from infection with a satisfactory yielding capacity. Nos. 1221 and 110 and Katahdin, though more severely attacked and less productive than the foregoing, nevertheless compared favourably in both respects with Rural New Yorker, Triumph, and Earlaine.

Folsom (D.) & Rich (A. E.). **Potato tuber net-necrosis and stem-end browning studies in Maine.**—*Phytopathology*, xxx, 4, pp. 313–322, 1 fig., 1940.

The transitory symptom of potato leaf roll known as net necrosis may be distinguished in various ways from the non-parasitic stem-end browning in Maine [*R.A.M.*, xvii, p. 479], where a comparative study of the two diseases was made during the winter of 1937–8.

Microscopically, stem-end browning differs from net necrosis in its involvement of both phloem and xylem, only the former being affected by leaf roll. Hill [ibid., xviii, p. 475] mentions other points of contrast also. Using depth of penetration as a gauge, discoloration in more than one ring of a cross section of a tuber at 12 mm. from the stem end generally connoted incipient leaf roll, whereas the zone invaded by stem-end browning extended to less than that distance. Stem-end browning is usually of a darker colour than net necrosis, the discoloured strands being fairly continuous instead of disconnected, and involves a smaller number of concentric zones than net necrosis.

Prior to 1921, net necrosis appears to have occurred only sporadically in Maine but outbreaks of both this disease and stem-end browning were recorded in the State in 1923 and 1939. Up to 20 per cent. stem-end browning occurred in the 1936 crop from Aroostook County, where 19 per cent. of the tubers in 40 bins of the 1937 Green Mountain crop were affected by net necrosis. Neither disorder has so far been observed in the Katahdin and Chippewa varieties. The ratio between the percentages of the leaf roll and net necrosis phases in individual lots of 29 Green Mountain stocks ranged from 1 : 1 to 9 : 1, indicating that the presence of net necrosis serve as a general guide to the incidence of leaf roll, but it is scarcely a reliable indicator for individual batches of tubers.

Stem-end browning was experimentally shown to exert no adverse effect on yield, neither has any evidence been obtained of its perpetuation through the seed. The underlying cause of the trouble would seem to reside in some environmental condition or complex of conditions in the field, but so far no correlation has been established between stem-end browning and soil type, previous occurrence in the soil, previous fertilizer treatment, soil nutrients, hydrogen-ion concentration, or moisture, presence of virus diseases, origin of commercial strain, injury to the parent plant, time and method of digging, and certain storage conditions. Within a given stored lot, stem-end browning was negatively correlated with tuber weight (average in two lots 4·61 and 3·56 oz.) and net necrosis positively (5·03 and 5·56 oz.).

Martin (A. L.) & Altstatt (G. E.). **Black kernel and white tip of Rice.**—*Bull. Tex. agric. Exp. Sta.* 584, 14 pp., 2 figs., 1940.

The results of an investigation into rice diseases in Texas, begun in 1937, showed that *Curvularia lunata* is the fungus most frequently associated with black kernels [*R.A.M.*, xix, p. 43], being found in 40 to 80 per cent. of all black grains. *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xviii, p. 546] and *Alternaria* sp. are also capable of producing black kernels but tend to make the grains soft and chalky,

so that they disintegrate during milling. Black specks on the grains caused by *Trichoconis caudata* [loc. cit.] are usually rubbed off at the same time. *C. lunata* is the only organism that does not destroy the hard, grain-like structure of the kernel, although it causes entire discoloration.

The results of inoculation experiments showed that *C. lunata* does not produce a systemic infection. Infection of soil, stem injections, or spraying with spore suspensions failed to produce infected seeds, but dipping or spraying the blossoming rice heads in an aqueous spore suspension or dusting them with pulverized black kernels resulted in a large number of discoloured grains. *C. lunata* was frequently isolated from rice grains showing black spots and it was believed that such infections were carried by insects. Hypodermic injection of *C. lunata* spores into rice seeds in the milk and mature stages in imitation of insect bites in the field gave 100 per cent. infection, a few typical black kernels being produced and every inoculated seed showing a minute, dark spot caused by the needle puncture. It is suggested that insects are instrumental in spreading the disease in the field, but many of these infections fail to develop unless the grain becomes damp and heated in the shock or stack. The following are the control measures recommended against black kernel: destruction of all rice straw stacks immediately after threshing; cutting and burning of weeds and volunteer rice; growing the late crop as far as possible from the early one to prevent the fungus spores stirred up by the threshing of the latter infecting the former; and keeping the grain and shocks dry to avoid heating.

The results of observations on white tip of rice have already been noticed from an earlier paper [ibid., xix, p. 363]. It is suggested for the control of this condition that small-scale trials should be conducted locally to ascertain the requirements of a given soil area. It is recommended generally to apply 200 to 300 lb. magnesium sulphate or 500 lb. of a high magnesium lime per acre.

Katznelson (H.). **Survival of microorganisms introduced into soil.**—*Soil Sci.*, xlix, 4, pp. 283–293, 1940.

All the micro-organisms, comprising a number of typical soil bacteria, fungi, and Actinomycetes, inoculated into five soils of varying organic matter content at the New Jersey Agricultural Experiment Station [*R.A.M.*, xix, p. 431] rapidly decreased in prevalence, while three, including *Fusarium culmorum*, disappeared altogether. The only instance in which this fungus survived for 105 days in two soils, one acid and the other deficient in organic matter, was in the presence of 1 per cent. lucerne. The soils harbouring the maximum numbers of *Pseudomonas fluorescens* (the persistence of which was also stimulated by the addition of dried blood or lucerne) and *F. culmorum* were the most active microbiologically. It is suggested that the survival of these two organisms is correlated with their capacity for the utilization of the various decomposition products of the stimulatory substances.

Reichert (I.). **Diseases of industrial and medicinal plants.**—*Int. Bull. Pl. Prot.*, xiv, 4, pp. 77–78, 1940.

Continuing his enumeration of crop diseases in Palestine [*R.A.M.*,

xviii, p. 518; xix, p. 225], the writer (with the assistance of M. Chorin, G. Minz, J. Perlberger, and F. Littauer) presents a list of fungal, virus, and non-parasitic disorders of industrial and medicinal plants.

THOMAS (K. M.) & KRISHNA MENON (K.). **The present position of pollu disease of Pepper in Malabar.**—*Madras agric. J.*, xxvii, 10, pp. 348–356, 16 figs., 1939.

'Pollu' disease of pepper (*Piper nigrum*) [*R.A.M.*, xii, p. 267], an important contributory factor in the steady decline of the Indian export trade in this commodity since 1933–4, is characterized by hollow and light berries due to three causes, viz., physiological spike shedding, attacks by the flea beetle *Longitarsus nigripennis* and an unspecified gall fly, and a fungus, *Colletotrichum* sp., which is responsible for 4 to 13 per cent. of the total loss from the disturbance, amounting in some years to 50 per cent. of the marketable produce. The fungus produces circular or irregular grey spots on the leaves, on the upper surface of which the black acervuli appear in concentric rings. Stem infection begins at the tips and spreads downwards, gradually killing the young vines and tender runners from old ones. In old vines the attack starts in the branching region and the fungus is found near the nodes of the dead branches. The spikes are usually invaded at the site of their junction with the stem, the leaf axils whence they emerge affording favourable positions for the accumulation of water drops and spores washed down from the leaves. Once inside the spikes the fungus induces rotting of the tissue and shedding, especially in shaded and damp plots. The fungus also develops on the stalks of the spikes. On the berries a dirty brown discoloration of the rind commences from the top and extends downwards, sometimes accompanied by cracking. Further studies on the disease are planned.

Report on the British West Indies Central Sugar-Cane Breeding Station for the year ending September 30th, 1939.—39 pp., 5 graphs, [? 1940].

In this report [cf. *R.A.M.*, xviii, p. 623] it is stated that in breeding work against sugar-cane mosaic in Barbados 12 seedlings have been tested for 15 months or more without developing any symptoms of the disease.

A table is given showing the reaction to mosaic of certain Barbados seedlings tested in Jamaica and Uganda, as compared with their reaction in Barbados. The results are not final, but show clearly that apparent resistance in Barbados does not necessarily mean that the same seedling will prove to be resistant in Jamaica or elsewhere. If further reports confirm that B. 35187 (apparently resistant in Barbados) is susceptible in Jamaica, the strain of mosaic in that colony will have been proved to be different from the Barbados strain, and probably more virulent.

MOURASHKINSKY (K. E.). Горно-таежные трутовики Сибири. [Tinder fungi of the mountain forests of Siberia.]—*Trans. Omsk Inst. Agric.*, xvii, pp. 75–108, 17 figs., 1939.

This list of 20 of the rarer Polyporaceae, with notes on their morphology, habitat, and world distribution, is based on numerous collec-

tions made during 1921 to 1937 in the mountainous forests of Siberia (chiefly western districts).

MOURASHKINSKY (K. E.). Трутовики Сибири. II. О некоторых видах на лиственных породах [Tinder fungi of Siberia. II. On species attacking deciduous trees.]—27 pp., Omsk, Сель-хоз. Инст. им. С. М. Кирова [S. M. Kiroff's Inst. Agric.], 1940. Roub. 1.

This annotated list comprises seven Polyporaceae found on deciduous trees in Siberia [see preceding abstract].

CHARDON (C. E.), MILLER (J. H.), & MULLER (A. S.). **Ascomycetes from the State of Minas Geraes (Brazil).**—*Mycologia*, xxxii, 2, pp. 172–204, 37 figs., 1940.

This list of Ascomycetes collected in the State of Minas Geraes, Brazil, consists of 114 species, 21 of which are described as new [with Latin diagnoses], the following being worthy of mention: *Claviceps paspali* on *Paspalum* spp.; *Gibberella saubinetii* on rice, wheat, and maize; *Ceratostomella fimbriata* on *Crotalaria juncea*; *Phyllachora anonicola* Chardon n. sp. on soursop (*Anona* [*Annona*] *muricata*); *P. tropicalis* on guava; and *Discohainesia oenotherae* on strawberry (*Fragaria chiloensis*).

SNYDER (W. C.) & HANSEN (H. N.). **The species concept in Fusarium.**—*Amer. J. Bot.*, xxvii, 2, pp. 64–67, 1940.

The authors express the opinion that the Wollenweber classification of the genus *Fusarium* [*R.A.M.*, xiv, p. 708] is not sufficiently usable for the average worker and in the section *Elegans* in particular the species at present so overlap one another as to make satisfactory determination very difficult [cf. ibid., xiii, p. 143]. As a result of several years of intensive studies it is proposed that the species be based only on morphology and the forms on physiology (pathogenicity). This new concept of species is intended as a modification within the framework of Wollenweber's system, and it is stated to simplify species identification and to eliminate a multiplicity of names. For the section *Elegans* the new concept is formulated as follows: all members of the section constitute one natural group species which on the bases of usage and priority may be called *F. oxysporum*. This species is emended to reflect the basic morphologic features of the whole section in agreement with the description of section *Elegans* given by Wollenweber (1913). The parasitic forms in the section are recognized principally by their selective pathogenicities and are designated as distinct forms, while all saprophytic ones are classified as merely *F. oxysporum*. The species itself can be readily determined on morphologic criteria, and the distinct biologic forms by pathogenicity tests. A list is given of the 25 forms of *F. oxysporum* now recognized and named with their synonyms. [These are listed with full citations in the Supplement to this *Review* issued in July, 1940.]

JENKINS (ANNA E.). **Taphrina carveri recently discovered in Missouri.**—*Mycologia*, xxxii, 2, pp. 266–267, 1 fig., 1940.

Taphrina carveri [*R.A.M.*, xviii, p. 718] was collected in 1939 on

silver or white maple (*Acer saccharinum*) in Missouri, this being the first record of the species in the field since 1897.

Lauffer (M. A.) & Price (W. C.). **Thermal denaturation of Tobacco mosaic virus.**—*J. biol. Chem.*, cxxxiii, 1, pp. 1–15, 3 graphs, 1940.

The thermal denaturation of the tobacco mosaic virus was found in studies at the Rockefeller Institute for Medical Research to be a readily reproducible phenomenon and was shown to be a reaction of the first order. The energy of activation of the reaction in 0·1 M phosphate buffer at P_H 7 was computed to be about 153,000 calories per mole. The rate of the reaction at a given temperature was ascertained to be strongly influenced by modifications in the hydrogen-ion concentration, more rapid progress being made in alkaline than in acid solutions. The reaction rate also varied inversely with the initial virus concentration, being roughly twice as great in systems with an initial concentration of 3 mg. per ml. as in solutions with an initial concentration of 6 mg. per ml. Thermal inactivation of the virus [*R.A.M.*, xix, p. 370], using the bean [*Phaseolus vulgaris*] as a test plant, was found to proceed more rapidly than denaturation, measured by precipitation.

Best (R. J.). **Some effects of salicylate on plant viruses.**—*Nature, Lond.*, cxlv, 3677, pp. 627–628, 1 graph, 1940.

In the course of an investigation at the Waite Research Institute, University of Adelaide, on the effect of various anions on the precipitation of the paracrystalline solid phase of the tobacco mosaic virus (*Marmor tabaci* var. *vulgare* Holmes) [*R.A.M.*, xviii, p. 607] nucleoprotein from its solution in water, the salicylate ion was found to occupy a special position. The precipitate produced by potassium salicylate solutions at concentrations above 0·46 M consists of an insoluble, amorphous, white, granular deposit of denatured protein, the mechanical agitation or dilution of which does not cause re-solution. At the same time there is an irreversible loss of infectivity of the virus. The rate of inactivation is shown by graphical data to increase parallel with rising concentrations of salicylate and to follow a logarithmic course; it is further stated to be markedly influenced by temperature. With solutions of the salicylate of the order of 0·5 M inactivation was only partial, and at 0·1 M there was no loss of infectivity, stream double refraction, or solubility after 48 hours.

The tomato spotted wilt virus (*Lethum australiense* var. *typicum*) [loc. cit.] was found to be much more susceptible than tobacco mosaic to the inactivating effect of salicylates, succumbing after one hour to a 0·1 M solution of potassium salicylate. In this instance cystein was used to arrest oxidative inactivation of both the control and test suspensions.

Costa (A. S.), Lima (A. R.), & Forster (R.). **Necrose branca — uma moléstia de virus do Fumo (Nicotiana tabacum L.) e 'Fumo couve' como sintoma tardio.** [White necrosis—a virus disease of Tobacco (*Nicotiana tabacum* L.), and 'cabbage Tobacco' as a late symptom.]—*J. Agron., S. Paulo*, iii, 1, pp. 1–26, 24 figs., 1940. [English summary.]

Of recent years a virus disease has been observed affecting Virginia

Bright, Samson, Turkish, Kentucky, Flor Branca, Geudertheimer, and other tobacco varieties, as well as *Nicotiana sylvestris*, in several districts of São Paulo, Brazil. The symptoms develop in three successive stages, of which the two first, viz., white necrosis and apparent recovery, correspond in every particular with J. Johnson's streak [*R.A.M.*, xv, p. 535], while the third or 'cabbage-leaved' phase appears to be new. Its principal features consist in a thickening of the leaves, which are also of a smoother texture than those of healthy plants. Certain varieties with normally sessile leaves acquire a typically petiolate habit, while those ordinarily furnished with petioles exhibit modifications, Turkish, for instance, losing the remnants of the alae and auricles. The flower petals are partially separated, the upper end generally apiculate, with a tendency to shedding; the capsules formed are semi-sterile.

The disease was transmitted by grafting and rubbing to *N. glutinosa*, *N. rustica*, *N. alata*, *N. repanda*, *N. langsdorffii*, *N. longiflora*, *Solanum nodiflorum*, and *Nicandra physaloides*. On *Nicotiana sylvestris* and *N. repanda* the symptoms closely resemble those observed on tobacco: the other hosts generally develop a tapering foliar habit and partial separation of the petals.

The thermal death point of the virus under observation (white necrosis stage) lies between 50° and 55° C., its period of ageing *in vitro* ranges from 12 to 24 hours, and its tolerance of dilution is 1 in 100. These physical properties approximate very nearly to those of tobacco streak, and in conjunction with the symptomatological similarities suggest a close relationship.

KOENIG (P.). **Die Entwicklung der Reichsanstalt für Tabakforschung in Forchheim in zwölfjähriger Tätigkeit (1927–1938).** [The development of the Reich Tobacco Research Station at Forchheim during its twelve years of activity (1927–1938).]—*Landw. Jb.*, lxxxix, 5, pp. 651–668, 1940.

Phytopathological studies at the Forchheim (Baden) Tobacco Research Institute from 1927 to 1938 were largely concerned with the formidable problem of wildfire [*Bacterium tabacum*: *R.A.M.*, xv, p. 119; xvii, p. 205]. It is concluded from the investigations that the disease is not, as alleged, a new one introduced from America into Europe in 1916 and into Germany in 1924 [ibid., vii, pp. 125, 547], but merely the familiar 'rust' or 'frog eye' in different forms [cf. ibid., ix, p. 226].

DE FLUITER (H. J.). **Proeven en waarnemingen in verband met de bestrijding van het bruinvlek, Alternaria longipes (Ell. et Ev.) Mason.** [Experiments and observations in connexion with the control of brown spot, *Alternaria longipes* (Ell. & Ev.) Mason.]—*Meded. besoek. Proefst.* 65, pp. 1–40, 1 fig., 1939.

The outcome of the writer's intensive studies on the possibilities of combating tobacco brown spot (*Alternaria longipes*) [*R.A.M.*, xviii, p. 555], with which *Cercospora nicotianae* is stated to be almost invariably associated at the Besoeki (Java) Experiment Station [ibid., xvii, p. 490], may be summarized as follows. The methods tested were (I) chemical, (II) cultural, and (III) selective.

(I). In a large-scale field trial with the Kedoe variety, two to three applications of ammoniacal copper sulphate emulsion (45 gm. 25 per cent. commercial ammonia, 360 gm. soft soap, 70 gm. copper sulphate, and 18 l. water), Wacker's kupferkalk (1 per cent.), or Bordeaux mixture (180 gm. copper sulphate, 135 gm. unslaked lime, and 18 l. water) substantially increased the percentage of slightly infected plants and reduced that of severely diseased ones in relation to the untreated controls. These copper-containing mixtures, however, especially Bordeaux, caused extensive bleaching of the foliage and accentuated the pungency of the aroma in smoking—to an unpleasant degree in the case of Bordeaux. There was little difference in the results secured with two or three treatments, while in many cases a single application was equally efficacious. In another test on Hybrid 238 Bordeaux mixture tended to reduce the incidence of heavy infection on the thin leaves, but the differences between the treated and control plants were unimportant and inconsistent. There was no adverse effect on the aroma of the tobacco in this variety.

Chemical treatment against *A. longipes* would appear to offer little hope of success from a practical standpoint for the following reasons: the maximum severity of the pathogen at a critical period (just before or during plucking); the tendency of the appropriate fungicides to discolour the leaves and impair the aroma of the finished product; dependence on weather conditions; and the expenses incidental to the operations.

(II). Of the various cultural measures tested against brown spot, topping appeared rather to promote than hinder the attacks of the fungus, manuring gave conflicting results, and no definite conclusions can be drawn from the spacing trials, though some strongly suggestive indications were obtained that infection, particularly of the coarser leaves, increases parallel with the distance between the plants (Kedoe). Precocious maturity, a decisive contributory factor in the development of brown spot, should be avoided by the following precautions: not replanting every year on the same site; the interpolation of two or more rice crops between the tobacco seasons; timely preparation of the soil, thorough tillage and drainage, and the careful performance of such operations as weeding, banking up, and the like; the application of a fertilizer where indicated; early plucking; and sanitation of the plantations by (*a*) the removal and digging under or burning, at the onset of plucking, of the yellow or brown shrivelled lower leaves already infected by the fungus, and (*b*) the disposal, immediately after plucking, of the infected stalks.

(III). In selection tests there were no marked differences in susceptibility to *A. longipes* between the Hybrids Nos. 343, 344, and 362, but 238 contracted much heavier infection than the others, while a cross between this line and Canari was the most severely attacked of all. Lines 320 and 322 of Kedoe were much more resistant than 103 and 303.

In laboratory tests the conidia of the fungus began to germinate after half an hour in drops of water at an initial temperature of 27·4° C., rising slightly during the course of the experiment; after two hours germination was practically complete and hyphal production had begun.

SHEAR (G. M.) & USSERY (H. D.). **Frenching of Tobacco distinguished from thallium toxicity by spectrographic analysis.**—*J. agric. Res.*, lx, 2, pp. 129–139, 1 pl., 1940.

In studies on the relationship between frenching and thallium toxicity of tobacco [*R.A.M.*, xix, p. 438] undertaken in 1937 in Virginia, spectrographic analyses were made of the ash from healthy, frenched, and thallium-treated plants and also of samples of soil in which frenched tobacco had grown. Thallium was detected only in ash samples from plants grown in a nutrient solution to which thallium nitrate had been added, showing that frenching is not the same as thallium toxicity. It was possible to detect thallium in ash samples in amounts of less than 0·0001 per cent. and in ash samples from plants receiving only 0·016 of a part per million of thallium in the nutrient solution. The results of experiments with tobacco grown in culture solutions of varying nutrient and thallium content indicated that the weaker the solution the smaller the amount of thallium necessary to produce toxic symptoms. It was found that thallium is fixed in the tobacco plant in a way to produce a marked gradient, decreasing from the roots to the tips of the shoots. It is concluded, therefore, that the plant must have a continuous supply of available thallium if thallium toxicity symptoms are to continue to appear on the young leaves as they are produced. Gallium did not appear to have any relationship to frenching or thallium toxicity in tobacco.

FRIMMEL (F.) & LAUCHE (K.). **Versuch einer Bekämpfung der Mosaikkrankheit der Tomaten.** [An experiment in the control of mosaic disease of Tomatoes.]—*Obst- u. Gemüseb.*, lxxxvi, 1, pp. 2–3, 1 graph, 1940.

The writers observed in the course of attempts to control tomato mosaic at the Mendel Horticultural Experiment and Research Station, Eisgrub [Moravia], that the increase in blossom production runs roughly parallel, up to the third week in July, with the multiplication of the insect vector of the disease (*Thrips*) [but see *R.A.M.*, x, p. 64], which resides in the anther tubes. From this stage onwards, however, the two processes follow a divergent course, the flower production sinking while the propagation of the insect continues to rise until about the first week in August. The vectors are now compelled to migrate to their winter quarters in the soil, and the extensive spread of infection commonly noted during the second half of August is undoubtedly associated with this mass movement. At this critical juncture, therefore, it is essential to prevent the onset of migration by topping the plants down to below the last flower truss and burning the debris. By this means the number of insects was reduced from 60 per 100 flowers in 1937 to 40 in 1938 and 21 in 1939.

IVANOFF (S. S.) & YOUNG (P. A.). **Tomato fruit pox.**—*Phytopathology*, xxx, 4, pp. 343–344, 1 fig., 1940.

In south-western Texas in 1937 green tomato fruits were observed to bear a number of scattered, abnormally dark green, circular, elongated, or irregular dots, up to 3 mm. in diameter, imparting a mottled appearance and tending to predominate along the region extending

from the stylar scar to the pedicel. Several of the spots may coalesce to form streaks, while at a later stage many become sunken as pits or pox with ruptured surface tissues. The mottle spots occur on fruits of all ages, while those approaching maturity are more liable to show the pox phase, the transition from one form of the disorder to the other taking place in a few days. As the fruits colour, the dark green spots remain green or turn yellow, while the pox may cork over and appear as an abnormally large lenticel on the fruit surface. Besides excluding the affected fruits from the first grade, the pox spots may serve as foci of infection for fungi and bacteria. Fruit pox has been detected in five seasons of spring and autumn crops in the Winter Garden district where serious economic losses were sustained from the disease in the autumn of 1938 through the rejection of 10 per cent. of the harvested fruit. The Pritchard and Stokesdale are the most susceptible varieties in Texas, but Marglobe, Rutgers, Bonny Best, Earliana, Summerset, and Globelle have also been affected. The etiology of fruit pox, which has since been found in Illinois and Wisconsin and on fruit from Florida, Mexico, Puerto Rico, and Cuba, is still obscure.

Small (T.). **Tomato stem rot or canker (Didymella lycopersici Kleb.).** —*Rapp. aux États de Jersey, 1939*, pp. 22–32, 1940.

During the past ten years tomato blight (*Phytophthora infestans*) has declined in importance in Jersey, as a result of efficient spraying, but stem rot (*Didymella lycopersici*) [*R.A.M.*, xix, p. 68] has become more prevalent and destructive and is now the most serious fungal disease affecting outdoor tomatoes locally. In 1939 thousands of plants were killed by stem rot before any fruit had been picked. Early in the season the attack was confined to the main stem at soil level, but later all the aerial parts were affected, including the fruit. In May, only 2 to 4 weeks after transplanting from the propagating boxes, four growers lost 5,000 plants out of 12,000, 1,000 out of 7,000, 5,000 out of 22,000, and 4,000 out of 14,000. The available evidence suggested that infection came from the seed-box stage.

In 1938 only one example of stem rot was observed in young plants in boxes. In 1939 six examples were found, but very few seedlings were affected. When seedlings were grown in artificially infected soil, very few developed the disease, which indicates that at this stage plants are seldom attacked.

Experiments [which are described, and the results of which are tabulated] showed that tomato plants immersed in a spore suspension of the fungus before transplanting in the field became infected, the addition of Cheshunt compound to the spore suspension ($\frac{1}{2}$ and 1 oz. per gal.) failing to prevent infection. The first signs of stem rot developed on the main stem at (or occasionally just above) soil-level about 4 weeks after the plants had been set out in the field. These experiments show that the dipping of seedlings in contaminated water (perhaps contaminated in practice from a few infected seedlings) before planting may cause widespread infection and may possibly account for the serious losses incurred in May, 1939.

The fungus remained alive for over 12 months on tomato stems kept out-of-doors, and experimental evidence also showed that infection

may be contracted from soil containing diseased tissue from the previous season. In field tests infection was comparatively general and rapid when inoculum was placed in contact with the plants, but less so when the inoculum was placed one inch away from the stems. Also, when diseased plants were replaced immediately with others, the latter contracted the disease from the soil. Young infected plants may form a new root system and continue to grow for a considerable period before wilting.

The following tentative suggestions are made for control. Seed should be taken from healthy fruits. Old tomato stalks should not be used in the compost, and all compost soil should be steam sterilized or baked for 20 to 30 minutes at 210° to 212° F. All containers must be clean. Before transplanting, seedlings should be watered with a hose or watering-can instead of being immersed. Old canes used as supports should be disinfected with formaldehyde. Growers should try removing the leaves, when plants are dry, below the first truss while they are still healthy; a few should be removed when the third truss is reached, and a few more when the next trimming and tying are effected. The 'leg' should be sprayed two or three times during the season. As first crop tomatoes generally develop more stem rot than the second crop, the effect of planting second crop tomatoes should be tried. All old tomato plants and fruits should be removed from the field at the close of the season.

BOHN (G. W.) & TUCKER (C. M.). **Studies on Fusarium wilt of the Tomato. I. Immunity in Lycopersicon pimpinellifolium Mill. and its inheritance in hybrids.**—*Res. Bull. Mo. agric. Exp. Sta.* 311, 82 pp., 7 figs., 1 diag., 1 graph, 1940.

This is a full account of the authors' studies on the resistance of tomato to wilt (*Fusarium bulbigenum* var. *lycopersici*), a preliminary report of which has already been noticed from another source [*R.A.M.*, xviii, p. 766].

GILMAN (J. C.) & MCNEW (G. L.). **Fungi associated with tree cankers in Iowa. II. Diaporthe, Apiodiaporthe, Cryptodiaporthe, Pseudovalsa and their related conidial forms.**—*Iowa St. Coll. J. Sci.*, xiv, 2, pp. 129–153, 5 pl., 1940.

This further instalment of the writers' studies on the fungi associated with tree cankers in Iowa [*R.A.M.*, xv, p. 408] comprises descriptions of 12 species of *Diaporthe*, 1 of *Cryptodiaporthe* [ibid., xviii, p. 414], 2 of *Apioporthe*, 2 of *Pseudovalsa*, 8 of *Phomopsis*, and 3 of *Coryneum*. A key to the species is furnished.

DODGE (B. O.). **Two serious diseases of shade trees.**—*J. N.Y. bot. Gdn*, xli, 484, pp. 93–94, 1940.

Since 1935 London planes (*Platanus acerifolia*) have been suffering severe damage in Pennsylvania, Maryland, and New Jersey from a blight caused by a species of *Ceratostomella* which is still under investigation by Federal and State plant pathologists. Over 1,000 trees are reported to have been killed by the disease near Baltimore and more than 7,000 round Philadelphia and adjoining districts of New Jersey. The first symptoms appear in the form of cankers on the old bark and

brown streaks in the new underlying cortex of the trunk or large limbs; in cross sections the brown streaks show as radiating black lines extending for some distance into the trunk. Pirone, investigating the disease in New Jersey, believes that infection may spread through root grafts from one tree to another in the same row. Cracking of the bark and pruning wounds predispose the trees to infection, 50 per cent. of which in certain plantings has been found associated with cuts. The fungus may also be transmitted by pruning saws. *P. occidentalis* has been observed to suffer from the blight in North Carolina, Virginia, and Mississippi.

The organism responsible for bleeding canker of Norway maples (*Acer platanoides*) and other *A.* spp. in Rhode Island, Massachusetts, and New Jersey has been identified as *Phytophthora cactorum* [*R.A.M.*, xvii, p. 713]. In the writer's opinion, however, basal trunk rot of *Rhododendron* caused by *P. cryptogea* presents closer analogies with the maple canker.

WOLF (F. A.). **Cercospora leafspot of Red Bud.**—*Mycologia*, xxxii, 2, pp. 129–136, 2 figs., 1940.

A leafspot, commonly attributed to *Cercospora cercidicola*, with which *C. cercidicola* var. *coremioides* is considered to be synonymous, is stated to be the most conspicuous disease of red bud (*Cercis canadensis*) within the area comprising the Duke Forest [North Carolina]. In addition to the parasitic conidial stage a perithecial stage was observed, identical with *Sphaerella cercidicola*, which is renamed *Mycosphaerella cercidicola* n. comb. [with an emended diagnosis]. The spermogonia and carpogonia that initiate the perithecia develop in late summer and early autumn, and the perithecia mature by late March or early April of the succeeding spring. Pure cultures of the organism remained sterile. The pathogenicity of the fungus and the genetic connexion between the two stages was demonstrated in infection experiments, in which crude inoculum was used.

RAY (W. W.). **A new species of Taphrina on Alder.**—*Mycologia*, xxxii, 2, pp. 155–158, 2 figs., 1940.

A new species, *Taphrina macrophylla*, is described [with a Latin diagnosis] on *Alnus rubra* in California, this being the third of this genus on that host [cf. *R.A.M.*, xviii, p. 414]. The young leaves are affected in the spring, becoming greatly enlarged, often to several times their normal size, curled, and distorted, with a decided purple colour. After the ascospores are discharged the leaves shrivel, dry up, and fall, and then a new crop of healthy leaves is produced. The asci are cylindrical, rounded to truncate at the apex, and measure 40 to 55 by 12 to 19 μ; the ascospores measure 2·5 to 5·5 by 2 to 5 μ.

STEPHENS (R. P.) & GOLDSCHMIDT (W. B.). **A preliminary report on some aspects of Wattle pathology.**—*J. S. Afr. For. Ass.*, *1939*, 2, pp. 31–43, 3 pl., 1939.

The most serious disease of wattles (*Acacia mollissima* and *A. decurrens*) in South Africa is stated to be gummosis, the primary cause of which is unknown. Van der Byl has shown (*Sci. Bull. Dep. Agric.*

S. Afr., 4, 1914) that the first external symptom is the development on the cortex of blackish depressions, often exuding copious amounts of gum, corresponding to a breakdown in the phloem tissue, about half-way between the cambium and periderm. The general aspect is one either of mottling, which may extend many feet up the bole of the tree, or of butts discoloured by the presence of large, black, cracked patches gradually encircling the tree and involving the bole for a long distance. Partial or total recovery may ensue, but usually any secondary meristem, formed by the tree in an attempt to isolate the diseased condition, itself becomes affected and in severe cases the trouble spreads inwards to the cambium, eventually causing death. Van der Byl reports the disease as having been present in Natal since 1908 or 1909, but the ex-Conservator of Forests for Natal, Zululand, and the Orange Free State informs the writers that it was observed several years earlier in the Eastern Cape Province. To-day gummosis occurs on all types of soil and under the most varied conditions, the only factor definitely associated with an enhanced incidence being an excess of soil moisture, though a tendency to increased severity on old native kraal sites has frequently been noted. Trees of any age may suffer from the disease, which is most prevalent, however, among those of 2½ to 5 years old.

The 'Albert Falls disease' may be recognized either by the general yellowing or slight withering of all the foliage on a tree or by the death of only one or two branches. Within 5 to 15 days of the appearance of these signs even the most vigorous trees die. The most susceptible age seems to be between one and five years. Among the fungi isolated from diseased material were a *Pestalozzia*, a *Fusarium*, *Schizophyllum commune* [*R.A.M.*, xix, p. 175], and *Diplodia natalensis*, which is also associated with collar rot of wattles, first reported from the eastern Cape in 1930 [ibid., xvi, p. 787].

The study of these diseases is considered to be of immediate practical importance.

BRENER (W. H.). **Multiple use sprayer for the application of liquid fertilizers, insecticides, and soil disinfectants in forest nurseries.**—*J. For.*, xxxvii, 8, pp. 630–631, 1 fig., 1939.

Particulars are given of a mechanical sprayer for the application, e.g., of sulphuric acid, formaldehyde, or other fungicides used against damping-off [*Pythium de Baryanum*, *Corticium solani*, &c.], in forest nurseries at sowing time. The equipment, which treats 400 standard seed-beds per hour or 4 acres per diem at the Wisconsin Central State Forest Nursery, consists of a 200-gal. Meyers' wooden tank mounted on a second-hand 1½ ton truck. The tank is furnished with a pressure pump and a powerful agitator. The liquid is distributed through two horizontal pipes with $\frac{1}{16}$ in. nozzles, the normal rate of application being 1 gal. per 100 sq. ft.

HAHN (G. G.). **Dasyscyphae on conifers in North America. IV. Two new species on Douglas Fir from the Pacific coast.**—*Mycologia*, xxxii, 2, pp. 137–147, 2 figs., 1940.

In a further contribution to this series [*R.A.M.*, xiv, p. 266], descriptions [with Latin diagnoses] are given of two new species of *Dasyscypha*,

namely, *D. pseudotsugae* and *D. ciliata*, found on Douglas fir [*Pseudotsuga taxifolia*] on the Pacific coast. *D. pseudotsugae* was found to be definitely associated with cankers and roughened bark of living trees, although no experiments were undertaken to determine whether the cankers were caused by it. The fungus occurs on suppressed trees or those growing on poor sites, in various areas from California to British Columbia. It is most closely related to *D. calyciformis*, but differs from it in its host relationship and spore characters; its conidia occur abundantly and germinate readily within 24 hours, while those of *D. calyciformis* germinate with great difficulty. Conidial fructifications of *D. pseudotsugae* were readily produced in pure culture. Present observations indicate that *D. pseudotsugae* and the cankers it is associated with have little pathological importance.

D. ciliata is a saprophytic species and occurs not very abundantly in the Pacific Northwest. It is restricted in its growth to the small shaded-out, dead branches and twigs. An imperfect stage is apparently lacking in the life-history of this fungus.

Wirka (R. M.). **Preservation of timber by the steeping process.**—[*Publ.*] *For. Prod. Lab., For. Surv., U.S. Dep. Agric.*, 9 pp., 1 fig., 1939. [Mimeographed. Received June, 1940.]

Full directions are given for the preservation of timber by steeping in solutions of zinc chloride, mercuric chloride, sodium fluoride, and water-soluble proprietary disinfectants, supplemented by tabulated treatment and service data on fence posts of various kinds of wood treated with one or other of the chemical compounds recommended for this purpose.

Mason (L.). **'Ascu' wood preservative.**—*Curr. Sci.*, ix, 4, pp. 187–188, 1940.

The author states that the withdrawal of the publication entitled '"Ascu"—a wood preservative' by the Forest Research Institute, India [*R.A.M.*, xix, p. 378], became necessary to prevent large-scale failures due to users repeating mistakes made in the past, which may possibly have resulted in some way from information given in the publication in question. The Institute, it is emphasized, has not completely condemned ascu.

The originator of the process stated that any illiterate *mistri* could work an ascu-treating plant, but experience has shown that such is not the case. Another difficulty has arisen in the changes in composition and concentration that take place in the ascu solution when in contact with wood. These changes are not the same for all species, and with some the variations are considerable, so much so that after only one treatment the solution in the service tank may have been rendered almost useless. The treatment originally recommended, at a low pressure for 15 minutes, has been found inadequate in practice to secure complete penetration and good absorption even in the perishable sapwood of some species. Other factors, some of them mentioned in the withdrawal note, have also come to light.

The Institute considers that until the difficulties presented by the

new preservative are more completely understood it cannot endorse its use indiscriminately.

Bier (J. E.). **Studies in forest pathology. III. Hypoxylon canker of Poplar.**—*Tech. Bull. Dep. Agric. Can.* 27 (*Publ.* 691), 40 pp., 9 pl., 1 map, 1940.

During the past eighteen years, canker of aspen poplar (*Populus tremuloides* and *P. grandidentata*) due to *Hypoxylon pruinatum* [*R.A.M.*, xviii, p. 1] has been reported on many occasions in widely separated areas in Canada and the United States, from the Atlantic coast to Alberta, in Minnesota, and in every stand examined in Ontario.

The fungus invades the young bark and cambium of the trunks and branches, forming cankers (found on trees up to 65 years old) which girdle and kill the affected structures and cause the death of all distal parts. In old trees the trunk cankers occur in the upper part of the bole, indicating that susceptibility depends on the age of the bark. The cankers are found quite commonly on the healthy, rapidly growing members of a stand, as well as on weakened trees. In the vicinity of Toronto incipient cankers are always associated with wounds, punctures by a wood-boring beetle, a species of *Oberea*, usually providing means of entry. The cankers make faster growth along than around the trunks and branches. Trunk cankers on 10- to 15-year-old trees are generally at least 3 ft. long before the trees are girdled.

Ascospore discharge was observed to take place most actively immediately after rain, the length of the discharge period averaging from 20 to 30 hours following a heavy rain. The asci were discharged in rapid succession, from 45 to 61 being observed to discharge in one minute. In most instances a single ascus passes through the ostiole at one time and the spores are discharged after the top of the ascus and the uppermost one or two spores have passed through the ostiole. Not infrequently an ascus passed through intact, and if not washed away such asci formed a black mound surrounding the ostiole.

The fungus was isolated in pure culture from ascospores, conidia, and diseased bark. Inoculations on wounded and unwounded bark of healthy aspens with mycelium from these three sources gave positive results on the wounded tissue only. Cultures of *H. pruinatum* were obtained from diseased bark isolations from the margins of artificially produced cankers. The imperfect fructifications became apparent on the induced cankers at the end of the first, or during the second, growing season. The primary perithecial stromata developed about three years after inoculation. The perfect stage formed at all seasons. Trees 4 to 7 in. in diameter were girdled and killed three and a half years after experimental inoculation. Natural cankers frequently develop the conidial stage in their first year's growth, but the perfect stage was found only on cankers at least three years old.

Day (W. R.). **Forest pathology section.**—*Rep. Imp. For. Inst., Oxford, 1938–39*, pp. 15–18, 1939.

In this report it is stated that the dying of 70-year-old Douglas fir [*Pseudotsuga taxifolia*] in the New Forest was due in one case to lightning injury, possibly assisted by *Phomopsis pseudotsugae*, and in

another to unsuitable soil conditions, with *Adelopus gaeumanni* [*Phaeocryptopus gaeumanni*: *R.A.M.*, xviii, p. 425] as a possible contributory factor. With reference to the second case, it is pointed out that in certain difficult soils, owing to a variable water table, older trees are unable to maintain a permanent root system, except in the poor, dry surface layers, and as a result cannot survive unfavourable seasons without becoming diseased. *P. gaeumanni* has been observed in Devonshire, Somerset, North Wales, and Roxburghshire.

Preliminary work is now in progress on the widespread failure of young European larch plantations in England [ibid., xix, p. 179]. Inoculations of European larch in co-operation with G. G. Hahn, using a strain of the larch canker fungus identified by him as *Dasyscypha willkommii* [ibid., xviii, p. 74], caused die-back and necrosis of small twigs in the absence of frost injury.

F. H. Jones obtained clear evidence that a chlorosis of beech in the Thames valley was due to iron deficiency; much, if not all, of the chlorosis of beech prevalent on chalky soils probably results from the same cause.

A preliminary survey of a serious root rot of *Thuja plicata* in the Forest of Dean, necessitating early felling in some places, indicated that the condition is mainly due to *Armillaria mellea*.

Report of Lands, Parks, and Forests Branch for the fiscal year ended March 31, 1939.—*Rep. Dep. Min. Resour. Can. 1938–9,* pp. 68–167, 1940.

In Canada the remaining stand of eastern white pine (*Pinus strobus*) is largely centred in Ontario and western Quebec, where control of *Cronartium ribicola* [*R.A.M.*, xix, pp. 176, 314] is simpler than on the Atlantic seaboard or the Pacific slope, owing to the relative dryness of the climate in Ontario, and the scarceness of domestic black currant bushes on the largely unsettled Crown lands. Experimental evidence indicates that *Ribes* eradication is feasible in these eastern areas, where the *P. strobus* stand is estimated at about 8,000 million board ft. of saw material and 10 million cords of pole timber.

Jack pine [*Pinus banksiana*] railway sleepers were inspected in 1938 after 13 years' service. The renewals among untreated sleepers through decay amounted to 81·9 per cent. for sleepers affected with red rot due to *Fomes pini* [ibid., xv, p. 330; xviii, p. 73] and 83·8 per cent. for sleepers not so affected, the corresponding figures for creosoted sleepers being 3 and 0 per cent. A study is being carried out to determine whether *F. pini* continues development in red-stained wood so as to produce red rot under conditions found in sleepers in service. Examination of cultures from sleepers removed from an experimental track in 1937 indicated that during the eight-year service period of the experiment *F. pini* and fungus No. 2 were gradually dying out in the untreated sleepers, numerous moulds and secondary wood-destroying fungi entering in their place. These sleepers mostly showed advanced decay. Of the wood-rotting fungi *Lenzites sepiaria* was the most common and active.

Petri dish tests indicated that lead fluosilicate and zinc fluosilicate were approximately three times as toxic as zinc chloride and a mixture

of zinc chloride and sodium dichromate, but in wood-block tests there was little, if any, difference in toxicity.

A cheap preservative treatment for the butts of telephone poles has been devised. Longitudinal holes are bored close together in the butts near the circumference, and alternate holes are filled with copper sulphate and sodium arsenite pastes and plugged. The poles are treated and set up as soon as possible after being cut, and the bark is left on up to the ground line. Evaporation of moisture from the top draws the preservatives up the sapwood. The adjacent copper and arsenic salts are water-soluble, but do not soon become exhausted, as the slightly soluble cupric arsenite is precipitated by diffusion, with the result that the treatment remains effective for several years. After five years' service treated poles were still in good condition, though the untreated controls were decayed at ground-level. The method has been commercially applied to 1,600 poles in a power-line.

In sleepers removed after nine years' service, only a small percentage of zinc chloride remained in those treated with an average of ½ lb. zinc chloride per cu. ft. Decay was progressing under the rail-seat.

To test the validity of the widely held view that pine lumber made from logs which have been river-driven or stored for prolonged periods in water does not develop blue stain [ibid., xviii, p. 363] as readily as that made from logs not leached by water, an experiment was conducted in the summer of 1938 with red pine and white pine logs. The results tended to support the view tested, but further tests are required before final conclusions can be reached.

SCHNELL (R.). **Observations sur deux 'balais de sorcière' de l'Épicea.** [Observations on two 'witches' brooms' of Spruce.]—*Bull. Soc. bot. Fr.*, lxxxvi, 5–6, pp. 318–323, 1 fig., 1 diag., 1939.

Full particulars are given of the anatomical structure of two witches' brooms of spruce (*Picea excelsa*) [*P. abies*] corresponding to those described by v. Tubeuf [*R.A.M.*, xvii, p. 493], one collected in the Vosges in 1936 and the other in the Juras in 1937.

WILSON (J. D.). **The fixed coppers as a new weapon for use in the fight against vegetable diseases.**—*Market Gr. J.*, lxvi, 8, pp. 206–210, 1940.

The dust formula now being recommended in Ohio for the control of most vegetable diseases consists of 6 per cent. metallic copper, 15 per cent. wheat flour, and the balance talc or some other suitable filler, e.g., clay, whiting, gypsum, or bentonite. In practice this involves the use of 12 lb. of a fixed copper compound with a 50 per cent. copper content, 15 lb. wheat flour, and 73 lb. talc for ordinary purposes, but cucurbits should be given a lower dose of copper (8 lb.). The fixed coppers may also be substituted for Bordeaux on crops sensitive to injury by this material, a typical spray formula being composed of 4 lb. copper compounds, 4 lb. wheat flour, and the prescribed quantity of a standard spreader per 50 gals. water, though a 2–4–50 spray or the 12–15–73 dust is effective against tomato, celery, pepper [*Capsicum annuum*], and beet leaf spots [*Septoria lycopersici*, *S. apii*, *Cercospora capsici*, and *C. beticola*].

KREBS (W.). **Verhütung von Krankheiten in der Pflanzenanzucht.** [Disease prevention in plant cultivation.]—*Blumen- u. PflBau ver. Gartenwelt*, xliv, 6, p. 53, 1 fig., 1940.

Generally speaking, the writer has found liquid fungicides more reliable than dusts in the treatment of vegetable seeds, uspulun and ceresan being the most widely used (in Schleswig-Holstein). Great care must be taken not to exceed the prescribed concentration and immersion period (0·25 per cent., one hour, in the case of uspulun); however, for beans [*Phaseolus vulgaris*], peas, and carrots the duration of the dip should not exceed 30 minutes and for tomatoes 20, otherwise germination will suffer. Celery scab [*Phoma apiicola*: *R.A.M.*, xiii, p. 73] is best controlled by 24 hours in a solution of 20 gm. copper sulphate in 1 l. water, together with the disinfection of walls, frames, and benches with 2 to 5 per cent. formaldehyde or 10 per cent. soda. Blackleg of cabbage [*Pseudomonas campestris*] may be combated by watering with 0·1 to 0·25 per cent. uspulun or by the application of brassicol to the soil at the rate of 20 gm. per sq. m. The latter preparation is also useful against lettuce rot [*Sclerotinia minor*: see below, p. 512] and onion smut [*Urocystis cepulae*].

MOERICKE (V.) & WINTER (G.). **Eine Virose des Blumenkohls in Deutschland.** [A Cauliflower virosis in Germany.]—*Z. PflKrankh.*, l, 3–4, pp. 172–177, 4 figs., 1940.

During the summer of 1938 the writers observed in the Bonn and Cologne districts of Germany a virus disease of cauliflowers causing up to 90 per cent. infection, the very variable symptoms of which, including dark green strips along the leaf veins, bordered by narrow, yellowish zones, curving of the midrib, and 'savoying' or total malformation of the leaves, appear to relate it to the mosaic described by Tompkins from California [*R.A.M.*, xvii, p. 6]. Features apparently peculiar to the local strain of the virus are broad, pale strips along the veins and necroses of the apical margin, combined with an almost slipper-like backward bending of the upper edge and swellings of the intercostal areas. Similar mosaic-like symptoms have been observed on Brussels sprouts, Savoy cabbage, and kohlrabi (severe on the last-named). Positive results were given by transmission experiments (rubbing the abraded leaves of healthy plants with diseased juice) after an incubation period of 18 to 20 days on 11 cauliflower varieties, white and red cabbage, and Brussels sprouts, the two last-named hosts sustaining particularly heavy damage.

BREMER (H.). **Beobachtungen quantitativer Art über das Auftreten von Schäden an Gemüsepflanzen, auf dem Versuchsfelde der Zweigstelle Aschersleben der Biologischen Reichsanstalt für Land- und Forstwirtschaft während der Jahre 1929 bis 1935. 1. Mitteilung.** [Observations of a quantitative character on the occurrence of injuries to vegetable plants on the experimental field of the Aschersleben branch of the Biological Institute for Agriculture and Forestry during the years 1929 to 1935. Note 1.]—*Z. PflKrankh.*, l, 2, pp. 71–84, 1 graph, 1940.

Most of the observations in this paper deal with insect pests, but the

following item concerning club root of cabbage (*Plasmodiophora brassicae*) is of interest. During the period covered by the investigations, not a single case of the disease was detected, and numerous inoculation tests conducted with the fungus in the field failed. The absence of the pathogen is characteristic of the entire vicinity of Aschersleben, i.e., the northern foothills of the Harz Mountains and the adjoining fertile plain of Magdeburg, the typical soil of which is loess, containing 12 to 15 per cent. carbonate of lime in a state of exceedingly fine division and consequently giving a neutral to weakly alkaline reaction. Large-scale trials are in progress to determine the factor conferring immunity on the local soils as compared with those of a similarly alkaline reaction in other places where the disease appears to be rife [*R.A.M.*, xi, p. 16].

CHAMBERLAIN (E. E.). **Turnip mosaic. Extended host range and identity.**—*N.Z. J. Sci. Tech.*, xxi A, 4, pp. 212–223, 7 figs., 1939.

Turnip mosaic in New Zealand [*R.A.M.*, xviii, p. 234] was transmitted by inoculation with sap or through *Myzus persicae* to the following new hosts: stock (*Matthiola incana*), wallflower (*Cheiranthus cheiri*), white mustard, water cress, *Capsella bursa-pastoris*, *Lepidium ruderale*, *Sisymbrium altissimum*, *Cardamine heterophylla*, *Coronopus didymus*, and *Nicotiana glutinosa*. Naturally infected white mustard, stock, and wallflower plants all showed stunting. In addition, white mustard showed a pronounced light and dark green mosaic of the leaves, the dark green areas being often raised, producing a blistered, crinkled appearance; in the glasshouse these symptoms are preceded by vein-clearing of the young leaves. Infected stock plants showed abnormally small, slightly crinkled leaves, with an inconspicuous mosaic which gives them a stippled appearance, and in severe cases the leaves tended to roll upwards at the margins; the flowers were 'broken', white streaks appearing on self-coloured flowers. Leaves of wallflower plants were small and slightly crinkled, showed an indistinct mosaic mottling, and were curled downwards at the tips; a bunched appearance was produced by curling and proliferation of the foliage; flowers were 'broken', with yellow streaks on deep red or brown flowers. Symptoms are also described on experimentally infected hosts. Since the disease is so readily transmitted to weed hosts it is probable that the virus overwinters in them.

The virus remained viable *in vitro* for two but not three days, tolerated dilution to 1 in 100 but not 1 in 1,000, and was inactivated by ten minutes' exposure to a temperature of 55° to 60° C. Turnip mosaic in New Zealand thus closely agrees with cabbage black ring [ibid., xviii, p. 364] in methods of transmission, insect vectors, physical properties, and host range. There are, however, some points of difference: black ring produces chlorotic and necrotic rings on the foliage of cabbage, cauliflower, and other plants, whereas turnip mosaic causes only a faint mosaic mottling on the leaves of these hosts; in the United States black ring occurs naturally on cabbage, cauliflower, broccoli, and Brussels sprouts, while the New Zealand turnip mosaic occurs in the field only on the swede, turnip, rape, white mustard, stock, and wallflower.

VIRGIN (W. J.) & WALKER (J. C.). **Relation of the near-wilt fungus to the Pea plant.**—*J. agric. Res.*, lx, 4, pp. 241–248, 1 pl., 3 figs., 1940.

In further studies on 'near-wilt' of peas (*Fusarium oxysporum* f. 8) in Wisconsin [*R.A.M.*, xix, p. 253] the causal fungus was found to penetrate the young seedlings of both resistant and susceptible pea varieties most commonly at the root tip and the cotyledonary node, but occasionally at almost any point along the root and epicotyl. Under certain conditions, not yet determined, the fungus was able to produce a definite seedling root rot. Upon entering the plant the progress of the fungus was largely confined to the xylem vessels. In many of the susceptible varieties the fungus was found to travel the entire length of the stem, while in the case of the resistant Rogers K and some of its hybrids the pathogen did not advance beyond the eighth node. The fungus reaches the seeds of diseased plants through the vascular system. It was found both in the seed coats and cotyledons. It is believed that dwarf, late-maturing, susceptible varieties are more likely to produce infected seed when grown in infested soil than are the early-maturing ones. There is little doubt that seeds infected by the near-wilt organism will produce diseased plants.

NOLL (W.). **Über weitere Befallsymptome und Massnahmen zur Verhütung von Schäden durch Ascochyta pinodella Jones, A. pisi Lib. und Mycosphaerella pinodes (Berk. u. Blox.) Stone bei Erbsen.** [On additional symptoms of infection and measures for the prevention of damage by *Ascochyta pinodella* Jones, *A. pisi* Lib., and *Mycosphaerella pinodes* (Berk. & Blox.) Stone on Peas.]—*Z. PflKrankh.*, l, 2, pp. 49–71, 8 figs., 1940.

Continuing his studies at the Bonn Phytopathological Institute on the infection of peas by foot rots (*Ascochyta pinodella*, *A. pisi*, and *Mycosphaerella pinodes*) [*R.A.M.*, xviii, p. 831], the writer differentiates the symptoms caused by these pathogens as follows. *A. pinodella* strews the pods with minute, brown to black dots, scattered obliquely to the longitudinal axis, coalescent over large areas, and forms unicellular conidia in pycnidia distributed at random. *A. pisi* produces circular spots up to 9 mm. in diameter, with blackened and thickened edges and pale centres, the latter densely studded with pycnidia giving rise to bicellular conidia. In the case of *M. pinodes* the lesions are also circular, but brown (never black), up to 7 mm. in diameter, often concentrically zonate with a darker centre and an ill-defined margin; the pycnidia, extruding bicellular conidia, are strewn over the whole spot but more densely near the edge.

In a sample of 200 diseased Konserva–Mark seeds (1936) the average percentages of infection by *A. pinodella*, *A. pisi*, and *M. pinodes* were 35·5, 29·5, and 36·5, respectively. In 1938 the average germination of five 1936 samples attacked by the three fungi was 10, 50·7, and 7·8 per cent., respectively, as compared with 61·2 per cent. for sound seed. In agar cultures the germination percentages of seed infected by *A. pinodella*, *A. pisi*, and *M. pinodes* were 9·7, 34·5, and 11·3, respectively, as against 96·9 for the healthy controls.

Severely infected seeds bear a single, ill-defined, dirty yellow to

greyish-brown or black, wrinkled spot (occasionally several) on the side in contact with the pod wall, sometimes involving the cotyledonary leaves. The lesions due to *A. pisi* are less conspicuous than those of the two other pathogens, but a differential diagnosis on this basis is scarcely feasible.

The use of healthy seed of approved germinability (preferably not home-grown in districts with a humid climate) is the best control measure, but treatment with a disinfectant dust, e.g., abavit-neu, fusariol 1454a, or ceresan U.T. 1875a (all at the rate of 2 gm. per kg.) somewhat improved the germinative capacity of weakly infected seed in 1938, the average increase from the three preparations being 14·5 per cent. *A. pisi*, shown by other tests to be the weakest of the three parasites under discussion, proved to be likewise the most amenable to fungicidal treatment. Peas immediately following peas are much more liable to damage than those preceded in the rotation by some other crop.

On the whole, field peas such as Hohenheimer rosablühende Futter and Peragis (*Pisum arvense*) were more resistant to *A. pinodella* in inoculation experiments than the table varieties, the most satisfactory of which in this respect were Nordost frühe grüne, Schorr's Rappoldshofer Viktoria, Delikatess, and Hohenheimer grüne Viktoria.

CHAMBERLAIN (E. E.) & BAYLIS (G. T. S.). **The occurrence of Onion yellow-dwarf in New Zealand.**—*N.Z. J. Sci. Tech.*, xxi A, 4, pp. 229–236, 4 figs., 1939. [Received April, 1940.]

Onion yellow dwarf, recently found in the Marshland district, New Zealand [*R.A.M.*, xix, p. 70], is stated to be confined to this district, where infection varies from a trace to 50 per cent., and to a seed-producing area at Blenheim. The disease has been observed on the principal varieties Turbott, Pukekohe Longkeeper, and Brown Globe. The symptoms agree closely with those described in America [ibid., viii, p. 350] and in Germany [ibid., ix, p. 223]. The leaves of infected plants become flattened, crinkled, and drooping, and later develop narrow longitudinal streaks; the bulbs are, on the average, smaller than those of healthy ones. The same foliage symptoms persist on second-year plants, flower stalks being sometimes streaked and bent or twisted, although remaining cylindrical. Infected first-year plants usually appear in groups or roughly circular patches within which 80 to 100 per cent. of the plants are diseased. In cases of heavy infection the patches coalesce and the disease becomes more or less general. The virus was successfully transmitted to onion and shallot by artificial inoculation (by the sand-abrasion, but not the tissue-insertion method) and by the aphids *Myzus persicae* and a related species, *Aphis laburni*, and *Macrosiphum solanifolii*. In the field the disease was observed only on onions, and no attempt was made to transmit it experimentally to any plant other than shallot. The fact that the disease appeared at Blenheim in all seed crops planted with bulbs from a diseased Marshland field indicates that the virus overwinters in bulbs. In order to effect the eradication of the disease the following control measures have been enforced: growing of onion seed crops and shallots in the Marshland district is prohibited; growers are instructed to destroy after harvest all injured or otherwise worthless onion bulbs, to lift the shallots, which may be sold for pickling

only, and not to grow jonquils [*Narcissus jonquilla*] in the vicinity of onion crops.

FRICKHINGER (H. W.). **Ursache und Verhütung der Salatfäule.** [Cause and prevention of Lettuce rot.]—*Kranke Pflanze*, xvii, 3–4, pp. 27–28, 2 figs., 1940.

The heavy damage inflicted on lettuce crops in Germany by *Sclerotinia minor* [*R.A.M.*, xvii, p. 433] may be combated by soil disinfection with 2 to 3 per cent. formalin, 0·25 per cent. uspulun (10 l. per sq. m.), or brassicol [ibid., xix, p. 361] (40 to 50 gm. per sq. m.), supplemented by preventive cultural and sanitary measures.

LING (L.). **Seedling stem blight of Soybean caused by Glomerella glycines.**—*Phytopathology*, xxx, 4, pp. 345–347, 1 fig., 1940.

In Szechwan Province, West China, soy-bean seedlings are stated to be frequently killed by the anthracnose fungus, *Glomerella glycines* [*R.A.M.*, xix, p. 256], shortly after emergence, when dark cankers appear on the cotyledon and spread downwards to the hypocotyl, causing decay and collapse of the young stem. Under humid conditions setose, black acervuli are produced in abundance on the lesions. Inoculation experiments by three methods: (1) one hour's immersion of the seed in a spore suspension; (2) pouring a spore suspension over the soil; and (3) mixing a fungus culture with the soil gave the following results in (*a*) sterilized and (*b*) unsterilized soil: (*a*) 100, 94, and 95 per cent., respectively, of the plants killed after emergence by (1), (2), and (3), respectively, compared with 3 per cent. in the controls: (*b*) 100, 38, 72, and 9 per cent., respectively. The primary source of infection is the mycelium, which survives in the seed for one to two years and has been experimentally shown to remain active in inoculated potted soils from the late autumn until the following spring. The conidia, on the other hand, are short-lived, withstanding desiccation only for 6 to 12 hours and rapidly losing their viability (no germination after 24 hours and only 2 per cent. after 18) even in their own matrix. The ascigerous stage of *G. glycines* has not yet been observed locally.

MAIER (W.) & MITTMANN-MAIER (G[ERTRUD]). **Die Verteilung und Häufigkeit der kurzen Internodien und der Doppelknoten bei reisigkranken Reben.** [The distribution and frequency of short internodes and double nodes in 'reisig'-diseased Vines.]—*Wein u. Rebe*, xxi, pp. 251–272, 1939. [Abs. in *Z. PflKrankh.*, l, 3–4, pp. 221–222, 1940.]

Shortened internodes and double nodes may be formed on any internode of a 'reisig'-diseased vine shoot [*R.A.M.*, xix, p. 67], but were found in the writers' investigations to predominate in certain sites. Thus, 72 per cent. of the total number of shortened internodes were found along the tenth internode and those immediately above and below it, while 83 per cent. of the double nodes were situated between the 9th and 14th. These relationships remain regular in different seasons and in widely separated districts. The abnormalities in question may involve over 90 per cent. of the shoots on every vine in a given vineyard.

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WIANT (J. S.) & TUCKER (C. M.). **A rot of Winter Queen Water-melons caused by Phytophthora capsici.**—*J. agric. Res.*, ix, 2, pp. 73–88, 5 figs., 2 graphs, 1940.

A rot of Winter Queen watermelons grown in Colorado was observed on the New York City market in 1935 and 1936 (but in none of the consignments received during 1937 and 1938), affecting from 5 per cent. or less to nearly all of the melons. The causal organism was identified as *Phytophthora capsici* [cf. *R.A.M.*, xix, p. 254]. In culture it had optimum, maximum, and minimum temperatures of 80° to 85°, 95° to 100° (for growth in four days), and 45° to 47·5° F., respectively. No growth occurred at 45° in 19 days. Maximum decay development in inoculated fruits occurred at 85°; at 63° to 70° lesions attained a diameter of 45 to 79 mm. in four days; at 50° old lesions continued to enlarge slowly, but new lesions were not apparent in 14 days; and at 45° no decay developed in 14 days. The fungus was experimentally found to penetrate the apparently unbroken rind of Winter Queen watermelons. The results of several tests showed that under favourable temperature conditions the decay can readily spread within the container from diseased to healthy melons. The fungus proved to be capable of infecting unwounded fruits of pepper [*Capsicum annuum*], tomato, apple, cantaloupe, cucumber, and squash, and roots of carrot, and also wounded orange and lemon fruits and potato tubers. It is suggested for the control of the rot that reduction of carrying temperatures to 50° would materially retard decay and that maintenance of a temperature of 45° would completely arrest decay during the transit period.

SINHA (S.). **On the characters of Choanephora cucurbitarum Thaxter on Chillies (Capsicum spp.).**—*Proc. Indian Acad. Sci.*, Sect. B, xi, 4, pp. 162–166, 10 figs., 1940.

The author presents some observations on the causal organism of chilli wet rot (*Choanephora cucurbitarum*) [*R.A.M.*, xv, p. 280] in the Lucknow district of India supplementary to those recorded by J. F. Dastur (*Ann. Bot., Lond.*, xxxiv, pp. 399–403, 1920). Contrary to the experience of the latter, and also of F. A. Wolf, who described the same fungus on squash in the United States (*J. agric. Res.*, viii, pp. 319–328, 1917), the zygospores developed as well from conidia derived from cultures (on Brown's medium in this instance) as directly from the host. Another point of difference consists in the production of sporangia on

the host (as already recorded by Palm and Jochems for the fungus on *Amaranthus blitum* [*R.A.M.*, iv, p. 254]), and not only in culture, where they occurred both in company with and apart from conidia. Like Wolf, the writer detected diminutive sporangia among those of normal dimensions; in the present case there was a corresponding reduction in the size of the columella, which in fact was occasionally absent from sporangia so minute as to accommodate only a single spore. Variations from the normal course of conidiophore development, as already reported by Wolf, were similarly noted by the writer, the conidia sometimes arising directly from the surface of primary heads.

Sinha (S.). **A wet rot of leaves of Colocasia antiquorum due to secondary infection by Choanephora cucurbitarum Thaxter and Choanephora trispora Thaxter sp. (=Blakeslea trispora Thaxter).**—*Proc. Indian Acad. Sci.*, Sect. B, xi, 4, pp. 167–175, 29 figs., 1940.

During the rainy season of 1938 the foliage of *Colocasia antiquorum* in the Lucknow district of India was observed to be infected by *Choanephora cucurbitarum* [see preceding abstract] and *Blakeslea trispora*, occurring either separately or in conjunction with *Phytophthora colocasiae* [*R.A.M.*, xvii, p. 587]. The two first-named fungi induce a wet, pulpy rot and eventual collapse of the leaf blades, quite distinct from the blight due to *P. colocasiae*, and involving the petioles in severe cases. The first symptoms appear in August, coincident with the production of the conidia and sporangia of the fungi [see preceding abstract] in the lesions caused by *P. colocasiae*, and continue to spread, especially under very humid conditions, until late October.

The presence of conidia in *B. trispora* removes the supposed distinction between *Choanephora* and *Blakeslea*, on which the separation of the genera was based. It is therefore proposed to abolish the genus *Blakeslea* and transfer *B. trispora* to *Choanephora* as *C. trispora* (Thaxter) Sinha. Moreover, sporangiola, formerly regarded as peculiar to *Blakeslea*, have been observed in cultures of *C. trispora* on a synthetic nutrient medium containing potato starch.

Ling (L.) & Yang (Juhwa Y.). **A mosaic disease of Rape and other crucifers in China.**—*Phytopathology*, xxx, 4, pp. 338–342, 2 figs., 1940.

Rape and other cultivated crucifers are stated to sustain considerable damage in various parts of China [*R.A.M.*, xviii, p. 607] from a mosaic disease characterized by symptoms similar to those described by Tompkins for turnips in New York [ibid., xviii, p. 223], consisting in the early stages of a conspicuous vein-clearing spreading from the leaf base upwards and later replaced by veinbanding and interveinal mottling. Curvature of the midrib and distortion of the lamina often accompany the above-mentioned features, the expression of which is favoured by low temperatures, while those exceeding 20° C. tend to mask them. Plants contracting infection at an early age are usually much stunted and often killed. Other hosts of the virus include turnip, Chinese cabbage (*Brassica chinensis*), leaf mustard (*B. juncea*), and Chinese radish (*Raphanus sativus* var. *longipinnatus*).

The mosaic virus was transmitted by sap from diseased to healthy

rape seedlings, using carborundum as an abrasive, in a low percentage of cases, the incubation period ranging from 18 to 26 days. In greenhouse experiments with *Myzus persicae* some 50 per cent. infection was obtained after 15 to 24 days' incubation. On Purple Top White Globe turnip the rape mosaic virus induces coarse vein-clearing, ruffling of the leaf, and prominent dark green mottling. Chinese cabbage develops a coarse, yellowish type of veinbanding, frequently accompanied by curvature of the midrib and stunting. Leaf mustard reacts by marked rugosity, foliar distortion, and severe stunting, while on Chinese radish the symptoms resemble those described for rape.

In rape extracts the virus was inactivated after six days at 11° to 13°, the thermal inactivation point for a ten-minute exposure in a water bath lying between 60° and 65°. Tolerance of dilutions up to 1 in 6,000 was established.

Despite similarities in the symptoms of rape and turnip mosaic, the host range serves to distinguish the two viruses, the former, for instance, being unable to infect cabbage and cauliflower. Only in New Zealand [ibid., xix, p. 509] and Germany [ibid., xvi, p. 10], moreover, has rape apparently been recorded as susceptible in nature, and in neither country do the symptoms or host range agree with those of the Chinese virus, which must therefore be regarded as a separate entity.

JENKINS (W. A.). **A new virus disease of Snap Beans.**—*J. agric. Res.*, lx, 4, pp. 279–288, 3 figs., 1940.

The new virus disease of snap beans (*Phaseolus vulgaris*) reported from Georgia [*R.A.M.*, xix, p. 2] was successfully transmitted by hypodermic injections of fresh juice from diseased pods in the snap bean stage and through viable seeds from diseased plants. Attempts to transmit the disease by insects have so far failed, with the one possible exception of the tarnished plant bug, *Lygus pratensis*, nor was it transmissible by grafting. The disease was observed on practically all the commercial bean varieties in the writer's variety trials and on several naturally infected dwarf Lima beans [*P. lunatus*].

JENNY (J.) & HUBER (H.). **Stationäre Spritzanlagen, namentlich für den Weinbau.** [Stationary spraying installations, especially for viticulture.]—*Annu. agric. Suisse*, xli, 2, pp. 171–185, 9 figs., 3 diags., 1940. [French summary.]

This is an expanded account of the electromotor stationary spraying plant in use at the Swiss Federal Station for Fruit-Growing, Viticulture, and Horticulture at Wädenswil for the control of vineyard parasites [chiefly downy mildew, *Plasmopara viticola*: *R.A.M.*, xvii, p. 158] and also applicable in the orchard. The technicalities and economics of the system are fully explained.

MAIER (W.). **Die Häufigkeit der Zellstäbe in den Internodien der Triebe reisigkranker Reben.** [The frequency of intracellular cordons in the shoot internodes of 'reisig'-diseased Vines.]—*Wein u. Rebe*, xxi, pp. 240–250, 1939. [Abs. in *Z. PflKrankh.*, l, 3–4, p. 221, 1940.]

The number of intracellular cordons in the shoots of 'reisig'-diseased Burgundy vines [*R.A.M.*, xix, p. 512] was found to be highest in the

basal (2nd to 7th) internodes, in which 1,694 were counted as against only 57 in the 8th to 30th. The formation of intracellular cordons and the shortening of the internodes on vine shoots were found to be quite distinct processes of independent occurrence. Intracellular cordons predominate in the internodes laid down the previous year and overwintering in the buds; hence short internodes and double nodes are mostly found in the first newly formed internodes of the current season's growth.

WILLIAMS (P. H.), OYLER (ENID), WHITE (H. L.), AINSWORTH (G. C.), & SELMAN (I. W.). **Plant diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1939*, pp. 28–38, 1940.

In this report [cf. *R.A.M.*, xviii, p. 783], P. H. Williams states that during 1939 two samples of mushrooms [*Psalliota* spp.] attacked by *Verticillium malthousei* [ibid., xvii, p. 374] were received at Cheshunt, from Buckinghamshire and Surrey, respectively. Fungi found in casing soil included species of *Corethropsis*, *Geotrichum*, and *Haplotrichum*.

Stem-burning of tomato plants, resembling the symptoms of *Phytophthora* foot rot [*P. cryptogea*] was caused by fumes from a powder containing cresylic acid dusted on to plants. Several thousand tomato seedlings placed in pots washed in water containing a cresylic acid compound were also killed off.

Tomatoes in Guernsey were found to be attacked by *V. albo-atrum* and *Fusarium bulbigenum* var. *lycopersici*.

I. W. Selman found a strain of tomato mosaic (single-virus streak group) which did not readily induce streak lesions on tomato plants. Attempts are in progress to investigate the possibility of introducing this virus (A 15) into crop plants as a 'vaccine'.

The chief cause of cucumber root rot at Cheshunt was ascertained to be an unsuitable physical condition of the soil. The killed and weakened plants are invaded by organisms some of which, such as *F. solani* and *F. orthoceras*, are weak parasites.

In further work on *Verticillium* wilt of chrysanthemums [ibid., xviii, p. 783] Miss Oyler inoculated stems of rooted cuttings of the susceptible varieties Cheshunt White and Favourite above soil-level with a culture of the fungus. Twenty cuttings were placed in various situations with mean temperatures ranging from 56° to 75° F. The results indicated that some degree of control may result if the plants are grown at higher temperatures than those generally used. Cultures of the fungus kept in an aqueous solution of malachite green (1 in 20,000) for 96 hours were killed, though higher concentrations were tolerated for shorter periods.

I. W. Selman states that outdoor varieties of chrysanthemum affected by 'reversion to parental type' showed discoloration, distortion, and dwarfing of the flowers, reduction of leaf size, and 'breaking' of the flower colours. White, yellow, and bronze varieties were affected, the last-named showing yellow streaks on the florets. A few leaves presented a faint chlorotic mottling. Inoculation tests revealed that all of the five affected varieties contained a virus of the cucumber virus 1 type, possibly hitherto undescribed. The fern-leaf symptom induced in tomato seedlings was not accompanied by reflexing of the leaf lamina. Glasshouse chrysanthemums from another locality showed

closely similar symptoms, the disorder being most marked in the variety Pink Favourite, in which about 2 per cent. of the stock was affected. So-called 'running-out' of chrysanthemum stocks is probably due to this virus.

Further observations by H. L. White on carnation wilt (*V. cinerescens*) [ibid., xvii, p. 459] indicated that plants raised from contaminated winter cuttings generally show disease symptoms the following summer; a clean stock may usually be obtained from plants segregated in pots and surviving until August and September. When carnations were potted in soil taken from positions recently occupied by affected plants no wilting occurred in five months in soil taken from depths between 12 and 18 in. Five months' observations of the stem-inoculated plants and others exposed to soil infection by *V. cinerescens* showed that *Dianthus caryophyllus* was highly resistant, *D. deltoides* immune, and *D. caesius* immune from root infection, while *D. chinensis* and *D. barbatus* were very susceptible. A large percentage of perpetual flowering carnations (?*D. chinensis*) grown in contaminated soil also became infected.

WATERSTON (J. M.). **Report of the Plant Pathologist, 1939.**—*Rep. Dep. Agric. Bermuda, 1939*, 13 pp., 1940.

The following are among the items of interest in this report [cf. *R.A.M.*, xviii, pp. 505, 550]. *Septoria lycopersici* was locally severe on unstaked tomato plants. *Sclerotinia sclerotiorum* was found by T. A. Russell attacking parsnip [ibid., x, p. 637] petioles, the same organism also occurring in a particularly destructive form on *Dimorphotheca aurantiaca*. Diseases of other ornamentals included *Iris* rust (*Puccinia iridis*) [ibid., xix, pp. 168, 365] on varieties of the Spanish group at Tucker's Town only; a powdery mildew (*Oidium* sp.) [? *Erysiphe cichoracearum*] on cineraria [ibid., xviii, p. 459], controllable by dusting with sulphur; *E. cichoracearum* on *Zinnia* [ibid., xi, p. 377]; (?) *E. lagerstroemiae* causing flower and leaf blight of *Lagerstroemia indica*; leaf spot of *Hemerocallis* due to *Cercospora hemerocallidis* Tehon; *Peronospora parasitica* on garden stock [*Matthiola incana*]; and lily rosette [yellow flat: ibid., xvii, p. 589], the exceptional intensity of which coincided with a heavy increase in the population of the insect vector, *Aphis gossypii*, with the prevailing dry weather.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 4, pp. 211–215, 5 figs., 1940.

Mulberry blight caused by *Bacterium mori* [*R.A.M.*, xiii, p. 748] is stated to be of common occurrence in New South Wales. The following recommendations are based on experience in other countries: burning of all diseased branches and leaves, and spraying just before bud-burst, and again two or three weeks later, with a mixture composed of $1\frac{1}{2}$ oz. potassium permanganate, 1 lb. starch, and 5 gals. water, or one composed of 0·06 per cent. mercuric chloride and 1·5 per cent. slaked lime.

The leaf blight disease of carrots caused by *Macrosporium carotae* [ibid., xix, p. 324] was first found in New South Wales in 1932 and has since spread to new localities. The leaf spot disease of the same host caused by *Cercospora apii* [? *C. carotae*: ibid., xviii, p. 413; and cf. ibid., xii, p. 356] has been noted only once, in 1939. Both diseases were almost

certainly introduced with imported seed. The following measures against these diseases, based on experience elsewhere, are recommended: crop rotation including carrots only once in every three to four years on the same land; destruction of diseased foliage after harvest; and spraying with Bordeaux mixture 4–6–40 (plus 1 lb. of calcium caseinate as a spreader to 40 gals. spray) at intervals of 7 to 14 days in wet seasons. Spraying is not considered to be worth while in dry seasons.

Hollyhock rust caused by *Puccinia malvacearum* [ibid., xv, p. 776] is stated to have become one of the most common rust diseases in New South Wales. For the control of the disease the burning of all infected foliage and spent stems and dusting with lime-sulphur (1 in 50) several times during the season, particularly during rainy periods, are recommended. A local grower's experience has been that four applications of lime-sulphur at a strength of 1 in 40, begun as soon as the disease appears in the seed-bed, gave good control and caused no injury to the plants.

Plant pathology and physiology.—*Rep. Tex. agric. Exp. Sta., 1938*, pp. 72–81, [?1939].

Apart from work already noticed from other sources this report [cf. *R.A.M.*, xviii, p. 439] contains the following items of interest. W. N. Ezekiel states that rainfall during the growing season was favourable to cotton root rot, *Phymatotrichum omnivorum*, causing a reduction in yield estimated at about 7·6 per cent. of the normal. In laboratory studies by L. M. Blank some 17 carbohydrates were tested as carbon sources for *P. omnivorum* in a nutrient solution. The relationship between the utilization of various carbohydrates and the ability of the fungus enzymes to digest these carbohydrates was very close. The addition of zinc, iron, or manganese in small amounts to the nutrient solution resulted in considerable increases in growth of the fungus, whereas others, particularly copper cobalt and nickel, were toxic even at low concentrations [cf. ibid., xviii, p. 175]. In further studies on the part played by plant alkaloids in the resistance of plants to *P. omnivorum* [ibid., xix, p. 147] G. A. Greathouse and G. M. Watkins found that in roots of *Mahonia* [*Berberis*] *trifoliolata* and *M.* [*B.*] *swaseyi* the alkaloid berberine is impregnated in the walls of tracheids, vessels, and bast fibres, and is present in lumina of cells in the xylem and phloem rays and in the older phloem cells. A more or less continuous sheath of berberine-containing cells surrounds the root just beneath the periderm, forming a defence against the attacks of the root rot fungus.

G. E. Altstatt and A. L. Burkett report that treatment of seeds with ceresan gave positive results against *Bacterium malvacearum*, *Fusarium moniliforme* [*Gibberella fujikuroi*], and *Glomerella gossypii* [ibid., xix, p. 404]; treated seeds gave increased stands, but differences in yield were insignificant.

A. L. Harrison's trials showed that home-made Bordeaux mixture (4–4–50), commercial Bordeaux mixture, cuprocide 54, and copper hydro 40 were effective against bacterial spot of tomatoes (*Bact. vesicatorium*) [ibid., xviii, p. 421], and home-made Bordeaux mixture against early blight, *Alternaria solani* [loc. cit.]. Commercial Bordeaux mixture and cuprocide 54 were less effective, although the latter gave the

highest yields of marketable fruits. The addition of cottonseed oil to home-made Bordeaux mixture did not result in any increase in yield, although there was less leaf injury when the oil was used. In the control of damping-off of tomatoes [loc. cit.] the best results were obtained with cuprocide dust; fair control was obtained by treating the soil with a proprietary dust compound, DuBay 1155 HH, at a rate of 200 lb. per acre.

In G. M. Watkins's test for the control of black spot of roses [*Diplocarpon rosae*: ibid., xix, p. 348 and below, p. 540] several copper compounds were combined in various ways with different forms of sulphur. The best results were obtained with cuprocide, copper hydro 40, and Bordeaux mixture (3–3–50), among sprays, and cuprocide and copper hydro 40 among dusts. The addition of wettable sulphur seemed to reduce the efficiency of these fungicides.

A. A. Dunlap reports the occurrence of lodging of sorghum in certain regions of north western Texas [ibid., xviii, p. 389]. *Sclerotium bataticola* [*Macrophomina phaseoli*] was isolated from the majority of lodged stems, and *Gibberella fujikuroi* frequently from the remainder.

A. L. Burkett reports the results of fungicidal trials for the control of damping-off of beet, bush bean [*Phaseolus vulgaris* var. *nana*], broccoli, cabbage, carrot, cauliflower, lettuce, and parsnip. Seed treatment with ceresan, copper KB, semesan, zinc oxide (AAZ), and particularly cuprocide, applied as dusts, resulted in increased stands. Seedling injury was noted on broccoli and cabbage treated with ceresan. A soil drench ($1\frac{3}{4}$ lb. cuprocide 54 to 50 gals. water), applied to a 4 in. strip along the row directly after planting, and wetting the soil to a depth of 1 to $1\frac{1}{2}$ in., increased the stand of bush beans planted in September to 48 per cent. of the seeds planted as compared with 31 per cent. for the untreated rows.

Botany. *Ex* Work of the Agricultural Experiment Station during the year ending June 30, 1937.—*Bull. Mo. agric. Exp. Sta.* 413, pp. 29–33, 1940.

In this report [cf. *R.A.M.*, xvi, p. 158] it is stated that in seed treatment experiments conducted by C. M. Tucker, J. J. White, and J. E. Livingston with eleven samples of winter barley, formaldehyde, ceresan, corona dust, ansul dust, cuprocide, copper carbonate, basic copper sulphate, dusting sulphur, and zinc oxide caused no significant injury to germination in samples germinated up to six months after treatment. Hot water treatments at various exposures all reduced germination, but notable recovery occurred in most cases, the treated seeds showing a higher percentage of germination two to six months after treatment than immediately after exposure. In field plots planted with high quality samples of Missouri Early Beardless and Kentucky No. 1 barley almost free from smuts (*Ustilago hordei*, *U. nuda*, and *U. nigra*), seed treatments with the same chemicals gave no significant increase in yield, while marked decreases followed the hot water treatments. In germination tests, Kentucky No. 1 showed more injury from every treatment than Missouri Early Beardless, but gave much less reduced yields, so that germination tests do not appear to be reliable criteria of the extent of injury from hot water seed treatments. When surface-sterilized seeds were plated, the internal fungi in [descending] order of frequency were *Alternaria*, *Gibberella*, *Fusarium*, *Chaetomium*, and

Helminthosporium, of which only *G.* and *H.* were pathogenic. Presoaking, prolonged hot water treatment, and ceresan eliminated more than half the internal fungi of Missouri Early Beardless, *F.* and *G.* generally being killed, while *A.* was more resistant.

C. M. Tucker states that when 50 seeds from each of 200 ears of Reid's Yellow Dent maize were germinated, the commonest fungus to develop was *G. fujikuroi*, *Cephalosporium*, *Rhizopus*, *Penicillium*, *Aspergillus*, and *Basisporium* [*Nigrospora*] also occurring [ibid., xix, p. 469]. Seed with under 40 per cent. infection gave seedlings with 23·8 and 7 per cent. root and shoot rot, respectively, the corresponding figures for seed with 60 per cent. infection being 39·2 and 10·1 per cent.

C. M. Tucker and K. W. Simons state that a serious disease of cultivated mushrooms [*Psalliota* spp.] has appeared at two localities in Missouri. The first sign of the condition is the appearance of a few sporophores in a small area in the bed with long, narrow, crooked stipes; the pilei do not reach a normal diameter, and are often tilted. The veil is ruptured early, and the pileus becomes prematurely flattened. The whole sporophore is greyish and dead-looking. Every outbreak occurred during the third break or later. At the next break, the affected area extends 5 to 10 ft. in all directions from the originally infected site, and the disease spreads at the rate of about 1 ft. per day, the infected bed being quite valueless. Inoculations of small beds with pure cultures of fungi and bacteria from diseased material gave negative results, but of three beds inoculated with infected soil one produced diseased mushrooms at the first break. Soil from a diseased bed taken to Columbia, kept for seven weeks, and used for casing beds, gave normal mushrooms at the first break. After two weeks, however, distorted mushrooms appeared. When soil from the diseased bed was kept at 55° C. for two hours, or treated with formaldehyde, calcium cyanide, or carbon bisulphide, and used for casing beds, normal mushrooms appeared throughout the season, all treatments eliminating the toxic condition. In experiments on control spread was effectively checked by soaking the soil and compost with mercuric chloride (1 in 250) in a 6-in.-wide strip 6 ft. in advance of the diseased mushrooms. Trenches 6 in. wide (and also 6 ft. in advance) were even more effective.

Further studies by C. M. Tucker on canker of sweet cherry nursery stock in north-western Missouri confirmed the view that it is due to *Bacterium pruni* [ibid., xv, p. 281]. Inoculation tests also showed that a strain from plum leaves was as virulent as the strain from cherry cankers. When the bacteria were placed in contact with wounded surfaces positive results were obtained, but no infection developed when infected plum leaves were hung among the foliage of sweet cherry trees. Natural infections probably occur in June, when the trees are wounded by the removal of laterals.

Gonçalves da Silva (S.). **Aspecto fitosanitário das principais plantas cultivadas do Estado do Espirito Santo.** [The phytosanitary aspect of the principal cultivated plants of the State of Espirito Santo.]—Reprinted from *Rev. Soc. brasil. Agron.*, xi, 4, 5 pp., 1939 (issued 1940).

A list is given of 114 pathogens of 24 cultivated crops inspected in the

course of a phytosanitary survey of the State of Espirito Santo, Brazil, in 1937–8. Among the problems requiring urgent attention are pod rot of cacao (*Colletotrichum gloeosporioides*) [*R.A.M.*, vi, p. 57; xvi, p. 312; xviii, p. 194], due to which 50 per cent. of fruits of the first flush failed to ripen on two of the properties visited in 1937; white rot of maize (*Diplodia zeae* and *D. macrospora*) [ibid., xvii, p. 238], causing a reduction of up to 20 per cent. in the weight of the seed-grain and gaps in the stand amounting to between 3 and 5 per cent. of the crop [cf. ibid., xix, p. 141]; a species of *Rosellinia* attacking 50 per cent. of the cassava plantings in newly cleared land [ibid., xvii, p. 192], and a complex root rot of obscure origin of the same host (70 to 80 per cent. loss in two localities); and gummosis of citrus (*Phytophthora parasitica*) [ibid., xvi, p. 603], which in 1937 infected 50 per cent. of the young trees in one district and 80 per cent. of the fully grown ones in another.

POSNETTE (A. F.). **Transmission of 'swollen shoot' disease of Cacao.**— *Trop. Agriculture, Trin.*, xvii, 5, p. 98, 1940.

Material from swollen cacao shoots was budded on to healthy stocks (chupons of three bearing trees in excellent condition) at Tafo in the Gold Coast, and twelve months later the three trees were observed to be severely affected with symptoms resembling those of 'swollen shoot' [*R.A.M.*, xix, p. 261]. In October, 1938, six buddings were made with swollen shoots, using as stocks native farm seedlings planted three to a hole, budding one in each group with a swollen bud and the other two with buds from Asuansi selections as controls. Two of the swollen buds took, one apparently killing the stock in a month. The remaining swollen bud lived on, the stock developing swollen-shoot symptoms three months after budding. No control plant developed the condition. In further budding and grafting three budlings and one graft survived, in all of which transmission from scion to stock took place.

In these experiments the first symptom was leaf chlorosis, which developed about six weeks to two months after budding. The chlorophyll of the old leaves broke down between the veins, while new leaves, as they appeared, were chlorotic, with green veins. Young leaves withered on breaking from the bud, leaving a green, leafless shoot with persistent stipules. Subsequently, axillary buds down the stem produced shoots, frequently in twos or threes, many of which died back before attaining a length of more than 2 in., and were swollen at the base. The final symptom was swelling of the main axis. This appeared five to eight months after budding, and was generally terminal, the apical bud dying. Node constriction sometimes occurred on fans.

These data indicate a virus origin for the condition. In 1939, 70 fresh cases were reported from the 60 acres of cacao at Tafo.

DILLON WESTON (W. A. R.) & BRETT (C. C.). **Seed disinfection.**— *Nature, Lond.*, cxlv, 3682, p. 824, 1940.

Field and laboratory tests demonstrated that cereal seed-grain dusted with materials containing organo-mercury compounds is unlikely to develop immediate injury if of high initial germination and sound physical condition, and superficially dry when dusted. If the seed is to be stored, no significant loss of germinative capacity is likely

to occur for some months if it is kept in a dry, cool, and well-ventilated place. With well-conditioned seed it is not possible to apply highly excessive doses of these materials, as the dust cannot be retained by superficially dry seed beyond a certain limit. If, however, superficial moisture is present on the seed, that part of the bulk of seed on which the dressing falls (even if applied at no more than the recommended rate) will retain an excessive amount of dust, and subsequent mixing will result in some seeds being heavily over-dusted. These may die, or they may produce abnormal seedlings. There was little evidence that treated seed suffers any serious injury immediately if its moisture content is slightly above normal. Seed with a high moisture content dusted at normal rates and then stored under satisfactory conditions appears to undergo no greater loss of viability than untreated seed of similar moisture content.

Müller (H.). **Selbsttätig arbeitender, vereinigter Kurznass- und Trockenbeizer 'Kombinator' Bauart Dr. Stümpfig der Landmaschinenfabrik G. Drescher, Halle (Saale).** [An automatically working combined short liquid and dry disinfection apparatus, 'Kombinator', constructed to the plan of Dr. Stümpfig of the agricultural machine factory of G. Drescher, Halle (Saale).]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), v, 3, pp. 22–24, 2 diags. 1940.

In collaboration with [K.] Ebertz, S. Reeh, and [A.] Winkelmann, the writer tested the combined short liquid and dry seed-grain dusting equipment 'Kombinator' [cf. *R.A.M.*, xix, p. 136] with extremely satisfactory results. The apparatus, treats up to 8 doppelzentner [approximately 16 cwt.] of heavy seed per hour.

Keil (J.). **Ein neuer Nährboden zu Keimversuchen mit Getreidepilzsporen. (Ustilago avenae, U. tritici, U. hordei, Tilletia tritici und Helminthosporium gramineum.)** [A new nutrient medium for germination tests with cereal fungus spores. (*Ustilago avenae*, *U. tritici*, *U. hordei*, *Tilletia tritici*, and *Helminthosporium gramineum*.)] —*Arch. Mikrobiol.*, xi, 1, pp. 85–88, 1 fig., 1940.

In large-scale germination experiments with cereal fungi (*Ustilago avenae*, *U. tritici*, *U. hordei*, *Tilletia tritici* [*T. caries*], and *Helminthosporium gramineum*) at the Vondran Machine factory, Halle, in 1939, the following procedure gave speedy and reliable results. The medium consists of 1,000 c.c. distilled water, 25 gm. sterilized agar, the filtered extract of 250 gm. oats boiled for one hour in 1,500 c.c. water, 20 gm. dextrose, and 10 gm. charcoal, the whole being boiled for ten minutes prior to the addition of 0·6 gm. potassium hydroxide per 100 c.c. and for a further two minutes before pouring into dishes. After 24 hours on this medium the loose smut and bunt spores were already giving rise to hyphae, while incipient conidial formation by *H. gramineum* was detected on the fourth to fifth day.

Leeper (G. W.). **Experiments on manganese deficiency disease ("grey speck") of cereals.**—*Proc. roy. Soc. Vict.*, N.S., lii, 1, pp. 138–152, 1940.

In continued plot experiments on the manganese deficiency (grey

speck) disease of cereals [*R.A.M.*, xv, p. 8; xix, p. 430] from 1934 to 1938, acidification of the soil with sulphur to below P_H 6·5 gave the highest yields of both oats and wheat, although during the winter the latter exhibited poorer growth, which improved later on. Application of ammonium sulphate with the seed caused some initial but little final advantage over the control in both oats and wheat. Alkalinization of the soil with caustic soda resulted in a marked improvement in oats up to the end of September, due apparently to the raising of the P_H value of the soil above 8·5. Application of manganese sulphate with the seed caused an increase in tillering (up to 24 per cent. in oats and 30 per cent. in wheat), but the final yields were never greater and sometimes less than on acid plots. The residual effect of manganese compounds applied to the soil in the preceding year was slight in oats; in wheat it was marked, a heavy application of freshly precipitated manganese oxide apparently exerting an effect as good as that of a fresh one.

In pot experiments, addition of a manganese compound, particularly manganese sulphate, caused excellent growth of oats. In pots with deficient sandy soils subjected to four weeks' waterlogging, sick oats plants recovered and showed excellent growth with no addition of manganese at any time. The results of pot experiments in which five different types of soil were heavily limed (with oats as the experimental plant) indicate that a considerable time must elapse before certain soils with a fair original reserve of available manganese are adversely affected by liming to above P_H 7, but where the reserve is low, deficiency appears soon after the application of lime.

Grace (N. H.). **The effect of nutrient salts in organic mercurial seed disinfectants on the germination and early growth of Wheat.**—*Canad. J. Res.*, Sect. C, xviii, 5, pp. 151–157, 1940.

In greenhouse experiments carried out in Canada, wheat seed-grain was treated with disinfectant dusts containing 5 per cent. ethylmercury halides (80 per cent. ethylmercury bromide and 20 per cent. ethylmercury chloride) and three concentrations of each of potassium nitrate, potassium dihydrogen phosphate, ammonium potassium hydrogen phosphate, and monocalcium phosphate. The results showed that this incorporation of nutrient salts into seed disinfectants failed to stimulate germination or early growth of seedlings. In one experiment with Marquis wheat, all salts except potassium dihydrogen phosphate increased root weight three weeks after planting. In the same experiment potassium nitrate accelerated the germination without increasing the final value, but no stimulation was observed in two subsequent experiments with four varieties of wheat.

Beckmann (I.). **El problema del Trigo en el Brasil.** [The Wheat problem in Brazil.]—*Rev. Fac. Agron. Univ., Montevideo, 1940*, 1, pp. 21–36, 1940.

In the course of a discussion on wheat-breeding in the Rio Grande do Sul, the writer refers to the great popularity of the Fronteira and Surpresa varieties, developed from crosses between the local varieties Pollisu and Alfred Chaves 6; both are resistant to yellow rust (*Puccinia glumarum*) and the former in particular is both productive and of

superior quality. It is, however, susceptible to brown rust (*P. triticina*) and of recent years has been attacked by black rust (*P. graminis*), the first severe outbreak of which on this variety occurred in 1933. Some promising crosses have been obtained between Fronteira and Centenario, combining resistance to all three rusts with other desirable qualities.

RODENHISER (H. A.) & TAYLOR (J. W.). **Effects of soil type, soil sterilization, and soil reaction on bunt infection at different incubation temperatures.**—*Phytopathology*, xxx, 5, pp. 400–408, 2 graphs, 1940.

In trials at the Arlington Experiment Farm, Virginia, with Hempstead and Mendon silt-loam soils, the former dark and rich (P_H 6·7) and the latter greyish-brown and friable (8·1), there were no appreciable differences in the incidence of bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] (L 2 race of the latter) in Marquis and Thatcher wheat seedlings incubated at 10° and 15° C., but at 5° the former variety developed 33 and the latter 42·2 per cent. more infection in the light than in the rich soil. Similar results were obtained in another test with eroded and clay loams (both having a P_H of 4·8, adjusted to obtain a range of up to 8·1 by the addition of calcium carbonate), consistently higher percentages of bunt occurring in the former than in the latter at 5° and 10°, whereas at 15° the differences were insignificant except at the most acid reaction, which induced 34·7 per cent. more infection in the clay than in the eroded loam. Soil type and temperature during the incubation period are thus closely interrelated in the determination of the degree of infection contracted by a given variety. Generally speaking, there was an increase in the amount of infection in both the eroded and clay loams from the highly acid samples to those approaching neutrality, especially from P_H 4·8 to 5·5.

No general conclusion could be drawn from the effects of steam sterilization on bunt infection. In the case of the Mendon silt loam the treatment reduced the incidence of the disease in both varieties at all three incubation temperatures, but on the Hempstead loam the results of the tests were inconsistent; a very heavy increase (from 30·9 to 94·6 per cent.) followed incubation at 5°, whereas at 15° there was a drop in the bunt count from 71·7 to 13·7 per cent.

STEVENS (N. E.). **Losses from bunt of Wheat in the United States.**—*Phytopathology*, xxx, 5, pp. 449–451, 1 graph, 1940.

A comparative analysis of the figures of the estimated wheat and rye crop losses in the United States from 1917 to 1937 due to (*a*) smuts in general and (*b*) bunt [*Tilletia caries* and *T. foetens*: *R.A.M.*, x, 716; xiv, p. 626] revealed a more or less steady decline in the incidence of both groups since the peak year of 1926, when the losses from the two sources were computed at about 4·7 and 3·9 per cent., respectively. It is apparent from a perusal of the two curves that bunt was responsible for a large proportion of the total estimated losses from wheat smuts: the incidence of infection in rye (subject to the same grading for 'smuttiness' as wheat) was too low during the period for which statistics are available for inclusion on the graph, but infected carloads were occasionally reported.

SALLANS (B. J.). **The use of water by Wheat plants when inoculated with Helminthosporium sativum.**—*Canad. J. Res.*, Sect. C, xviii, 5, pp. 178–198, 4 graphs, 1940.

In greenhouse experiments in Canada, wheat plants inoculated with *Helminthosporium sativum* showed a marked reduction in water loss during the early stages of growth as compared with uninoculated plants. The transpiring leaf area of the plant was markedly reduced up to the fourth leaf to appear. The later leaves, however, were larger, and as the early ones died the total transpiring area became equal to, and eventually greater than, that of uninoculated plants. This recovery, followed by an increase in yield of dry matter, took place only under favourable conditions, such as good light and high soil moisture. The variety Reward was more severely injured in the early stages and recovered more rapidly than Marquis. No significant increase was observed in water requirements of inoculated over uninoculated plants. It is believed that under field conditions, where competition for soil moisture and nutrients takes place, complete recovery of infected plants can hardly be expected. Several tentative explanations are offered for the recovery of the inoculated seedlings in the greenhouse. It may be that the toxin development by the fungus, which is probably responsible for the initial injury, is in later stages either reduced below harmful concentrations or arrested altogether, so that normal growth can be resumed; or the rate of intake of mineral ions into the plant may be increased under the toxic influence of the fungus, and as the effects of the toxic substances decrease, the presence of large amounts of minerals may result in the formation of larger leaves.

AJROLDI (P.). **Nuovo contributo allo studio biologico delle 'Tilletia'.** [A new contribution to the biological study of *Tilletia.*]—*Riv. Pat. veg.*, xxx, 3–4, pp. 149–157, 1940.

As a result of further experimental inoculations of rye, wheat, and the rye × wheat hybrid Terminillo with *Tilletia* [*T. caries* and *T. foetens*: *R.A.M.*, xvii, p. 165] the author concludes that under Italian conditions bunt is not transmissible to rye, and that the infection of wheat through lancet cuts by means of chlamydospores is possible only in the early stages of growth, the fungus requiring for its complete development a long period of growth within the host. From the results obtained it would also seem that the germinability of the chlamydospores reaches an optimum during their second year, virulence remaining high for at least the first five years. Further evidence was obtained that prolonged and difficult germination of wheat seed facilitates bunt attack. One Terminillo ear showed the presence of both bunt and a perfectly developed sclerotium of *Claviceps* [? *purpurea*].

GARRETT (S. D.). **Soil conditions and the take-all disease of Wheat. V. Further experiments on the survival of Ophiobolus graminis in infected Wheat stubble buried in the soil.**—*Ann. appl. Biol.*, xxvii, 2, pp. 199–204, 1940.

The results of continued studies on the take-all disease of wheat (*Ophiobolus graminis*) [*R.A.M.*, xviii, p. 386; cf. also ibid., xix, p. 465] are presented. Microscopic examination showed that the characteristic

dark mycelium of *O. graminis* continues to develop in the cells of artificially infected wheat straw after this has been buried in the soil. This development is markedly greater and more prolonged when excess of available nitrogen is present. These observations seem to indicate that the survival of the mycelium depends mainly upon the supply of available food material in the straw, which is limited by the supply of soluble nitrogen. Additional nitrogen directly benefits *O. graminis*, enabling the mycelium to assimilate more of the undecomposed carbohydrate reserves of the straw. Under soil conditions, such as high aeration, favouring general microbiological activity, the rate at which the available food reserves in the straw are used up is increased, and consequently the disappearance of the mycelium is hastened. On this new hypothesis, other soil micro-organisms are assigned a competitive rather than directly antagonistic relation towards *O. graminis*.

JOHNSON (T.) & BROWN (A. M.). **Studies on Oat blast.**—*Sci. Agric.*, xx, 9, pp. 532–550, 3 figs., 1 graph, 1940.

Greenhouse and field experiments [which are fully described] carried out in Canada showed that the amount of 'blast' disease developing on oats [*R.A.M.*, xix, p. 272] is readily affected by the nutritional condition of the plant from the initiation of the spikelets until just before panicle emergence. At this stage, blast was increased by (1) reducing the water supply, (2) withholding mineral nutrients, (3) artificially injuring the leaves, (4) leaf injury caused by a combined epidemic of stem and crown rusts [*Puccinia graminis avenae* and *P. coronata avenae*, respectively], and (5) growing the plants under progressively diminishing periods of daylight. In some varieties there was a tendency for oats sown early in May to show less blast than plants sown later. Decrease in yield was accompanied by a reduction in panicle size, and often by increase in the percentage of blasted spikelets.

REED (G. M.). **Reports on research for 1939. Plant pathology.**—*Rep. Brooklyn bot. Gdn, 1939* (*Brooklyn bot. Gdn. Rec.*, xxix, 2), pp. 51–56, 1 fig., 1940.

Many F_3 progenies of different oat crosses were grown in continuation of studies on the mode of inheritance of resistance to loose and covered smuts [*Ustilago avenae* and *U. kolleri*: *R.A.M.*, xviii, p. 587; xix, p. 466]. Duplicate sets of seed for growing 145 F_3 progenies of Green Mountain × Monarch were inoculated, one with physiologic race 1 of *U. avenae* and the others with race 3 of *U. kolleri*, the latter originating in France. The experimental data indicate that inheritance of resistance to both these smuts is controlled by a single factor difference, and further, that resistance to each smut is inherited independently. In the cross under observation, Green Mountain is susceptible to the race of *U. avenae* used in the tests, while Monarch is resistant; conversely, Green Mountain is resistant to race 3 of *U. kolleri* and Monarch susceptible. In similar tests with 265 F_3 progenies of Navarro × Hull-less, using races 1 of both smuts, to which the former variety is resistant and the latter susceptible, the inheritance of resistance to *U. avenae* and *U. kolleri* was found to be governed by two and three independent factors, respectively. Race 1 of *U. avenae* was inoculated into 165 F_3 progenies of the susceptible Goth-

land and resistant Navarro varieties, in which cross the inheritance of resistance was shown to be controlled by two independent factors [ibid., xix, p. 399]. Several factors were found to be involved in the inheritance of resistance to a highly specialized race of *U. kolleri* in 151 F_3 progenies of Navarro × Black Mesdag.

The following method of inoculation has been uniformly successful in the production of high percentages of infection; the hulls of the grain are removed, the kernels inoculated with dry smut spores, and the seed germinated in sand with a low moisture content at about 20° C.

Further inoculation experiments by L. G. Utter with 34 collections of smut resulting from hybridization between *U. avenae* and *U. kolleri* [ibid., xviii, p. 15] led to the differentiation of at least eight physiologic races of covered and seven of loose smut. Gothland continued to show susceptibility to *U. kolleri*, whereas the reactions of Monarch ranged from susceptibility to full resistance. The loose smut collections gave uniformly high infections on Monarch, while Gothland was resistant to some and susceptible to others.

Pursuing her studies on the varietal reactions of sorghum to loose and covered smuts (*Sphacelotheca cruenta* and *S. sorghi*) [ibid., xvi, p. 666], D. Elizabeth Marcy found Dakota, Amber, Sorgo, Dawn Kafir, and Shallu susceptible, and Feterita, Dwarf Yellow Milo, and Darso resistant. A combination of the following conditions retarding seedling growth contributed to the development of heavy infection on susceptible varieties: maintenance of a low soil moisture content (10 per cent. of the water-holding capacity); moisture supplied as a 2 per cent. sucrose solution; low temperature; very fine sand; and heavy tamping of the sand in which the seeds were germinated.

Schmitt (C. G.). **Cultural and genetic studies on Ustilago zeae.**—*Phytopathology*, xxx, 5, pp. 381–390, 1940.

In laboratory studies at the University of Missouri chlamydospores of *Ustilago zeae*, the agent of maize smut [*R.A.M.*, xviii, p. 670], germinated in 12 to 24 hours at 25° to 30° C. on modified Czapek's agar. At lower temperatures germination was atypical and retarded, delay likewise following exposure to monochromatic ultra-violet irradiation at 2,650A°, 21,000 to 56,000 ergs per sq. mm. [ibid., xix, p. 84], the lag period increasing with rising doses. Chlamydospores germinated in profusion immediately after collection, apparently without requiring any previous resting period. Plants of all ages were found to be highly susceptible in greenhouse inoculation experiments with compatible lines of the smut, as long as meristematic tissue was present, at a temperature range of 27° to 32° C.: below 21° no infection occurred but anthocyanin was formed at the site of insertion of the inoculum.

As already shown by Stakman and associates [ibid., ix, p. 713], the appearance of the colonies and mutation rate were strongly influenced by the composition of the medium, cultures on Difco maize meal agar giving rise to fewer sectors than those on more nutritive substrata, such as potato dextrose agar. On the basis of a comparative study of six different media from this standpoint, modified Czapek's agar, combining a fairly low rate of sectoring with good growth, was used for the

maintenance of stock cultures at temperatures below 18° and maize meal for the detection of mutation following irradiation. Between 20°, at which few or no sectors arose, and 37·5°, above the maximum for the lines under observation, rises in the incubation temperature were accompanied by an increased frequency of sectoring. The incidence of mutation was not affected by inbreeding for ten generations, by ultra-violet or X-ray irradiation, or by brief exposure of the sporidia to temperature near the thermal death point.

Attempts to induce chlamydospore formation in *U. zeae* in pure culture were uniformly unsuccessful.

Stocks exhibiting the characteristic mycelial and sporidial growth types were established in the parental generation and inbred as far as the tenth and seventh generations, respectively. Cream- and beige-coloured lines were laid down in the eighth generation and the latter inbred to the tenth. The mutation rate of sporidial lines was approximately three times that of mycelial. Segregation of factors for colour, sex, and growth type took place in both I and II of the reduction divisions, as determined by seriation of the promycelial cells, in ratios of 3 : 1, 1 : 1 (4 : 0 in one instance), and 1 : 3, respectively. Out of some 4,000 monosporidial lines, three were monopathogenic, but spores from galls produced by inoculation with one of these lines did not give rise to strains of a similar habit.

Barton-Wright (E. C.) & Tomkins (R. G.). **The moisture content and growth of mould in flour, bran, and middlings.**—*Cereal Chem.*, xvii, 3, pp. 332–342, 3 graphs, 1940.

A tabulated account is given of the writers' studies at the Research Association of British Flour-Millers, St. Albans, and the Low Temperature Research Station, Cambridge, on the effects of temperature, relative atmospheric humidity, and water content of the flour on mould growth in flour, bran, and middlings [cf. *R.A.M.*, xv, p. 574].

Small (4 gm.) samples of flour with an initial water content of 14 per cent. were spread on Petri dishes supported on glass tripods above museum jars containing solutions of sodium chloride (4 to 32 gm. per 100 c.c. water, corresponding to relative humidities of 97·5 to 79 per cent.), and stored at 20°, 15°, 10°, and 5° C. The development of moulds in the control samples (over jars containing no sodium chloride, 100 per cent. relative humidity) took place in 8, 11, 18, and 20 days, respectively, at 20°, 15°, 10°, and 5°, the corresponding periods at 97·5 per cent. humidity being 9, 11·5, 18·5, and 25 days; at 95·1 per cent. 12, 15, 20, and 27 days; at 92·6 per cent., 13, 18, 25, and 43 days; at 90·2 per cent., 14, 23, 36, and 53 days; and at 87·7 per cent., 18, 40, 64, and 123 days. At 85·1 per cent. relative humidity moulds appeared 29, 57, and 123 days at 20°, 15°, and 10°, respectively, no growth developing at 5°; at 82·5 per cent. they were observed after 79 at 20° only; and at 79 per cent. no infection occurred. In similar tests with bran, the moulds developed at lower humidities, appearing after 35 days at 20° at a relative humidity of 79 per cent. Flour exposed to humidities between 90 and 80 per cent. is attacked mainly by *Penicillium* spp., while bran under the same conditions is infected by both *P.* and *Aspergillus* spp. Mould growth has not been detected on wholemeal exposed at

a relative humidity of 75 per cent. at 20°, whereas bran under similar conditions showed fungal contamination after three to six months.

Most samples of flour containing over 16 per cent. of water were found to be just sufficiently moist to permit of mould growth, which does not ordinarily occur on those with a lower water content. Wholemeal containing 17 per cent. water is liable to mouldiness, which does not affect samples with 15·3 per cent. Bran with a water content of 17 per cent. became mouldy after 40 days and one sample with 15·3 per cent. after 90 to 120.

After 40 days at 20° the average numbers of fungal spores per gm. of flour with water contents of 19·6, 17, 16·5, 15, and 14 per cent. were 30,000,000, 5,000,000, 3,300, 5,300, and 5,100, respectively, while after 250 days the samples with water contents of 16·5, 15, and 14 contained 54,000, 3,000, and 2,900, respectively. After 40 days at 15° the samples with water contents of 19·6, 16·5, and 15 per cent. contained 32,000,000, 3,200, and 5,400 spores, respectively, the corresponding figures after 250 days for the two lower water contents being 38,000 and 3,300, respectively.

On the whole, these figures are in satisfactory agreement with those obtained by the method of exposing flour to atmospheres of different relative humidities, and support the conclusion that the critical water content for fungal growth is approximately 16 per cent. In commercial practice, however, this figure would be near the danger point, and to be on the safe side, a water content not exceeding 15 per cent. and storage at a relative humidity of 80 per cent. or less are advocated.

COTTERELL (G. S.). **Citrus fruit-piercing moths—summary of information and progress.**—*Pap. Third W. Afr. agric. Conf., 1938* (Gold Coast Sect.), pp. 11–23, 5 col. graphs, [? 1940].

In connexion with the author's investigations on the losses to the Gold Coast citrus crop caused by the depredations of moths (chiefly *Othreis fullonica* and *Achaea lenardi*), an inquiry was undertaken by H. A. Dade into the part played by fungi in the fall of grapefruit shortly after puncture by the insects. *Oospora citri-aurantii* and *Penicillium digitatum* were found to be the chief organisms involved, the mean intervals between moth puncture and fall of the fruit being 15 and 4·5 days, respectively. Sterile control punctures made with needles produced no effect, indicating that the fungi are responsible for fruit fall.

DASTUR (J. F.). **A new Corticium on Orange stem.**—*Indian J. agric. Sci.*, x, 1, pp. 89–92, 1 pl., 1940.

A diagnosis [in English only] is given of *Corticium album* n.sp., observed in 1938 in the Nimar district, Central Provinces, forming a white film, about 10 cm. in breadth, on the bark of orange trees from soil-level up to a height of about 30 cm. The growth is superficial and does not appear to injure the host. The fungus is critically compared with other species of *C.* for possible affinities, and evidence of its non-relationship presented.

BIALE (J. B.). **Effect of vapors from moldy fruits on coloring and respiration of Lemons.**—*Calif. Citrogr.*, xxv, 6, pp. 186, 212, 1 fig., 2 graphs, 1940.

The vapours given off by single mouldy lemons inoculated from pure

cultures of *Penicillium digitatum*, *P. italicum*, *Sclerotinia sclerotiorum*, and *Aspergillus niger* at the University of California were passed at a constant rate through cotton-wool filters into jars filled with 50 to 60 sound fruits. The effect on respiration was ascertained by determining the carbon dioxide evolved in three one-hour tests, during which the container with the infected fruits was disconnected from the jar.

The most striking effects in 13 tests on lemons and one on oranges were produced by the emanations from fruits infected by *P. digitatum*, which increased the evolution of carbon dioxide by 50 to 100 per cent. Cultures on potato dextrose agar produced similar results. The activity of this organism was definitely inhibited by low temperatures (20° C.), while high ones (25°) did not appear to cause any acceleration as compared with the normal experimental temperature of 14·5°. The effects of *P. italicum* on the respiratory functions were much slighter than those of *P. digitatum*, while those of *S. sclerotiorum*, *A. niger*, *Oospora*, and *Alternaria* (the two latter used in other tests) were negligible.

The emanations of *P. digitatum* induced a rapid yellowing of green lemons, a similar but slighter effect being exerted by *P. italicum*, and none by the other fungi tested. Shedding of the stem ends was induced by *P. digitatum* only. The gaseous products of this pathogen appear to have an effect on the fruit similar to that of ethylene [*R.A.M.*, xvi, p. 744; xix, p. 470].

[This work is also described in *Science*, N.S., xci, 2367, pp. 458–459, 1 graph, 1940.]

DWYER (R. E. P.). **Some investigations on Coco-nut diseases, associated with soil conditions in New Guinea.**—*New Guinea agric. Gaz.*, v, 3, pp. 31–53, 2 figs., 1 graph, 1939; vi, 1, pp. 2–37, 4 figs., 2 graphs, 1940.

A three years' investigation of a wilt disease of young coco-nut palms at Kokopo, New Britain, and Namatanai, New Ireland, in New Guinea, referred to in an earlier paper as an 'obscure physiological trouble' [*R.A.M.*, xvi, p. 670], showed that the palms affected were of the tall, very erect, and close-growing type, often presenting a frond-choked appearance. The roots of affected palms penetrated only the upper layers of soil, much less deeply than the roots of healthy palms. The appearance of the disease was associated with a pronounced spell of dry weather following on relatively heavy rains. A lowered vitality, due possibly to dry weather, insect attack, or fungal invasion, was a factor predisposing palms to disease. It is significant in this connexion that recovery was coincident with the proper cleaning-up of the plantation and more particularly with the incidence of abundant rainfall. When the palms were cut back judiciously later on and not too many fronds removed they made a good recovery. The disease had appeared in the affected areas in dry periods during three successive years (till 1937), but did not recur in the following two. The disease is compared with similar ones elsewhere and the close resemblance to 'bronze wilt' described from Trinidad [ibid., xvii, p. 390] is stressed. The evidence presented shows the disease to be most probably physiological, although the possibility of virus origin is not excluded. Soil analyses seem to indicate a certain amount of potash deficiency. It is proposed to desig-

nate this disease of young palms 'maturation wilt' as distinct from the more serious and permanent 'mature palm wilts'. The condition of frond-choke is characterized by erect and poorly-developed fronds, the outside leaves closely crowded round the growing point, and their bases bound together instead of growing free. As fresh fronds appear, they become progressively smaller, the palm presenting a sickly, yellow appearance. As far as is known this condition is not due to parasitic fungi; it is possibly of virus origin, but more probably due to physiologic causes. A necrotic deficiency spotting was noted on palm leaves in conjunction with the foregoing conditions; no organisms were found associated with the numerous small brownish spots present.

Mature coco-nut palms from the plantations situated on the deltaic and estuarine deposits of the Huon Gulf and Astrolabe Bay areas of the New Guinea mainland suffer from various types of wilt. Palms most likely to be affected are those growing on soils with unsuitable profiles, subject to waterlogging in the wet season and to drying-out and compaction in the dry season. Wilts of the 'bronze leaf' type are not nearly so severe or prevalent as in the West Indies. A general wilting is often observed after a long spell of dry weather in palms growing on light, porous soils of poor water-holding capacity; these palms recover immediately when rains set in. An extreme case of 'mature palm wilt' was observed in the Huon Gulf area on 21- to 27-year-old palms. 'Leaf droop' and 'leaf break' were most prevalent and the palms were stunted and bore poorly; in many areas tapering stem, yellowing, and bronzing of the fronds, and reduction in their size and number, were very noticeable. The condition clearly suggested unsuitable soil and cultural factors. The occurrence of nut fall on soil horizons with a shallow top layer and an excessive lime status is attributed to unsuitable soil and water relationships. Coco-nut palms grown after soil-exhausting native crops, sisal hemp [*Agave sisalana*], or tobacco usually appear stunted and weak, although they rarely assume an acutely wilted appearance.

What is stated to be the first undeniable diagnosis of true bud rot (*Phytophthora palmivora*) [ibid., xvi, p. 670] in New Guinea is reported from several plantations. The only losses of palms from bud rot occurred on heavy soils in regions with abundant rainfall. The following series of diseases were noted on areas affected by true bud rot, obviously influenced by related environmental conditions: leaf droop, leaf break, nut fall, frond fall, leaf scorch, deficiency spotting, taper stem, chlorosis, stem bleeding (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [ibid., xv, p. 15), *Pestalozzia* [*palmarum*], leaf-spotting, thread blight (*Corticium penicillatum*), *Botryodiplodia theobromae*, and a condition tentatively named 'gummy leaf'. It is suggested that many of these conditions, particularly the first nine listed, are symptomatic of the particular soil conditions prevailing, rather than distinctive diseases.

Recommendations for correct agricultural practices in relation to all coco-nut diseases, and particularly those of physiological origin, are summed up as follows: selection of suitable soils [cf. ibid., xviii, p. 104] for sites of new plantations; adoption of proper cleaning and planting methods and seed and nursery selection; eradication of soil-exhausting grasses; avoiding the cultivation of palms on land where soil-exhausting

native crops have previously been grown; use of drier ash and composted manure; application of complete fertilizers and potash manures to increase the vigour of the palms; and growing of cover crops on heavy soils.

SABET (Y.). **Mycorrhizal habit in the Date Palm (Phoenix dactylifera Linn.).**—*Nature, Lond.*, clxv, 3681, pp. 782–783, 2 figs., 1940.

Fifteen-month-old date palms grown at Cairo in pots containing Nile silt showed the presence of vesicular-arbuscular mycorrhiza [*Rhizophagus*: *R.A.M.*, xviii, p. 470]. The affected roots became hypertrophied and thicker and more opaque than uninfected roots, and sometimes simulated coralloid roots. The extramatrical mycelium was readily visible. The invading hypha formed a kind of appressorium before effecting penetration. After invading the thick, outer cellulose wall the fungus passed through the cell cavity, developed in a characteristic spiral manner through a radial row of cortical cells 3 to 4 layers deep, spread laterally and inwardly for 3 to 4 layers, producing spirals of hyphae within the cells, and finally ramified in the cortex, with the production of vesicles and arbuscles. In some instances the whole of the cortical cells and the intercellular spaces, except for the outermost 4–6 layers and the two layers next to the endodermis, were packed with the fungus. Further investigations are in progress.

Progress Reports from Experiment Stations, season 1938–39.—198 pp., 5 graphs, London, Empire Cotton Growing Corporation, 1940.

These reports [cf. *R.A.M.*, xviii, p. 573] contain, *inter alia*, the following items of interest. At Barberton, South Africa, soil dressings of superphosphate and sulphate of potash failed to give any significant reduction in *Alternaria* disease of cotton [loc. cit.], though the treated plots gave better yields than the control. Experimental evidence indicates that the condition is a debility disease.

A survey of cotton boll diseases at Barberton showed that internal boll disease (*Nematospora gossypii* and *N. coryli*) [ibid., xviii, p. 308] caused very little damage to the early-planted crop, in spite of early and, presumably, heavy insect immigration and a rise in vector population before all the bolls had matured to over 45,000 per acre. This escape is attributed to two facts, (1) insects carrying the fungi were only a small proportion of the immigrant potential vectors, and (2) most of the crop came from bolls formed relatively early. From pieces of lint taken from underneath insect punctures *N. gossypii* was isolated 87 times, *N. coryli* 16 times, *Eremothecium ashbyi* once, and an unidentified yeast-like organism 9 times, the lint being sterile in 128 instances. Almost all the infections were very slight.

Bacterial boll diseases were of three types in respect of means of entry (excluding those in which the boll walls were destroyed by larvae), viz. (1) direct attack on the uninjured boll wall tissues, the lesions advancing through the wall and bacteria eventually attacking the lint, (2) entrance through a channel left at the tip of the boll by incompletely joined carpels, and (3) entrance through insect punctures, with boll wall lesions, if present, spreading from within outwards. Three species of bacteria appeared to be concerned, *Bacterium malvacearum* and two

unidentified organisms, Y and G. Of these, *Bact. malvacearum* and Y appeared to be capable of considerable destructive activity under rather dry conditions, while G was associated almost entirely with bacterial rotting in very wet weather.

Wilt disease (*Verticillium dahliae*) was found in two plants at Barberton (no further spread being observed), and in a number of plants from Magut.

The seed disinfection test against *Bact. malvacearum* begun the year before in Swaziland [ibid., xviii, p. 573] was continued with ginnery seed mechanically delinted. The results showed a marked increase in germination rate on the plots with sulphuric acid-treated seed. As before, mercury treatments (two dusts and two wet preparations) and sulphuric acid markedly reduced primary infection. Because of the spread of infection from plot to plot, a further test was made, in which each plot was separated from the next by five rows of kaffir corn [sorghum]. Spread of infection was conspicuously reduced in the treated plots, infection in the sulphuric acid plots being 1·5 and 35 per cent. at 6 and 7 weeks, respectively, as compared with 8·6 and 90 per cent. at similar dates in the unprotected experiment.

In the Gezira (Anglo-Egyptian Sudan), cotton was generally infected by blackarm [*Bact. malvacearum*], but, except in localized areas, the attack was not severe. Leaf curl [ibid., xviii, p. 391] was negligible until late in the season. In the Gash Delta there was a severe attack on Domains Sakel cotton, but N.T. 2/36 was resistant. At Kadugli the new substrain N.T. 58, a promising, large-bolled, fruitful strain, showed marked resistance to blackarm and jassid infestation.

In the Bukalasa area of Uganda blackarm was not serious. The cotton wilt diseases due to *Fusarium* [spp.] and *V.* [*dahliae*: ibid., xviii, pp. 574, 575] are becoming increasingly important. It is impossible to distinguish between the two wilts in the field, and resistance is taken as being resistance to wilt. In the breeding plot, B. 181 derivatives were comparatively resistant, and in the main variety trial B. 181 showed more resistance than S.P. 84 and B.P. 116; as many plants free from external symptoms of wilt show discoloration in the xylem of the main stem, differentiation was made between external and internal symptoms. The evidence indicated that wilt incidence may be reduced by shading and lessening of exposure.

In the Serere area of Uganda blackarm was more prevalent than in the previous season, though the rainfall in 1938 was 12 in. less than in 1937. S.P. 20 and S.P. 84 were again more resistant than S.G. 29 [ibid., xviii, p. 574], but S.P. 102 was unsatisfactory. S.P. 84 has maintained its yield, its ginning percentage, its blackarm resistance, and its spinning quality over a wide range of variety trials.

In Trinidad the cotton disease known locally as 'crumple' was identified as anthracnose (*Gloeosporium* [*Glomerella*] *gossypii*) [ibid., xix, p. 404]. It was less prevalent than formerly. The *G*[*ossypium*] *barbadense* types from the dry countries of western South America are the most susceptible, and if grown outside in the rains serve as a reservoir of spores, from which an epidemic may develop in certain Upland strains and much of the local hybrid material. Marked differences in susceptibility are found in closely related material.

Clegg (Gladys C.). **The examination of damaged Cotton by the Congo red test: further developments and applications.**—*J. Text. Inst., Manchr*, xxxi, 5, pp. T49–T68, 10 pl., 1 fig., 3 graphs, 1940.

When samples of Sakel cottons were inoculated with different fungi and tested for tendering, a correlation was found to exist (with a few exceptions) between the results of the Congo red examination [*R.A.M.*, vi, p. 29] and fungal ability to decompose cellulose. With *Rhizopus* 85 (as numbered in the Shirley Institute culture collection, 1935–6) and *Aspergillus tamarii*, which showed no power to decompose cellulose, Congo red examination revealed no effect. With the following fungi, which showed moderate power to decompose cellulose, viz. *Penicillium* 2, *A.* 46, *A.* 45, *A. niger* 8, *A. niger*, *A.* 61, and Record 83 the Congo red test disclosed, respectively, (1) irregularly damaged cuticle after preliminary swelling in 18 per cent. caustic soda, (2) no effect, (3) no effect, (4) fine multiple spirals with some fibres bright red, (5) fine multiple spirals, bright red, (6) coarse spirals, and (7) bright red with incomplete deconvolutions. With fungi showing strong cellulose-decomposing ability, viz. *A.* 48, *P.* 42, *Fusarium*, and [*A.*] *fumigatus* the effects were, respectively, (1) bright red with incomplete deconvolutions, (2) the same, (3) bright red, splitting along quick spirals, and (4) bright red with incomplete deconvolutions.

Some forms of bacterial tendering were found to produce a highly characteristic appearance, while in others tendering was indistinguishable in the Congo red test from that due to fungal attack, and the distinction had to be made by standard staining tests.

Mechanical tendering is sometimes closely simulated, but for the presence of hyphae, by fungal tendering. Chemical tendering results in gradual breakdown of the cuticle. Biological tendering caused by fungi or bacteria may resemble mechanical or chemical tendering, but the disintegrated appearance of the fibres and their tendency to break up along the quick spirals, as well as the presence of the associated organisms, are distinguishing features.

Tomitu (K.), Sugiyama (K.), & Shiota (K.). **A case of induration of liver due to thrush-Oidium.**—*Orient. J. Dis. Infants*, xxv, 3, 13 pp., 1 pl., 1939. [Japanese, with English summary on p. 41.]

This is an account of a very rare, fatal case of induration of the liver in a five-year-old girl at the Children's Clinic of the Kyoto Imperial University, Japan, associated with the thrush *Oidium* [*Candida albicans*: *R.A.M.*, xix, p. 408]. Oidial elements were detected in profusion in the lymphatic apparatus and a few were also present in the spleen.

Jones (C. P.) & Peck (R. L.). **A green pigment from Candida stellatoidea and Candida albicans.**—*J. Bact.*, xxxix, 5, pp. 605–608, 1940.

A green pigment, serving as an indicator and giving blue-green and yellow reactions in acid and alkaline solutions, respectively, was found to occur in blood agar cultures of *Candida stellatoidea* and *C. albicans* [*R.A.M.*, xviii, p. 592 and next abstract] in experiments at the Duke University (North Carolina) School of Medicine. The pigment, which appeared to be a weak acid and somewhat unstable, was produced in

much larger quantities (more than tenfold) by *C. stellatoidea* than *C. albicans*, thus affording an additional means of differentiation between the two fungi.

MARTIN (D. S.) & JONES (C. P.). **Further studies on the practical classification of the Monilias.**—*J. Bact.*, xxxix, 5, pp. 609–630, 1940.

At the Duke University (North Carolina) School of Medicine the authors have studied 535 non-ascus-forming, mycelium-producing, yeast-like fungi [*R.A.M.*, xvi, p. 811]. The great majority of these were found to agree in all respects with the criteria established for the six species previously described, namely, *Candida albicans*, *C. stellatoidea* [see preceding abstract], *C. parakrusei*, *C. krusei*, *C. tropicalis*, and *C. pseudotropicalis*.

The reduction of the number of *C.* spp. by Langeron and Guerra [ibid., xviii, p. 253] is commended, but a further limitation is proposed through the relegation of *C. triadis* and *C. intermedia* to synonymy with *C. albicans* and *C. tropicalis*, respectively. *C. brumpti* and *C. flareri*, moreover, are nearly related to *C. parakrusei*.

The writers' separation of *C. stellatoidea* from *C. albicans* has been criticized, but in addition to cultural and enzymatic differences between the two organisms, the former is consistently non-toxic and the latter pathogenic to rabbits.

In conclusion it is pointed out that cultures kept on artificial media for many years are liable to undergo far-reaching dissociation [ibid., xix, p. 344] or other changes rendering them unsuitable for comparison in the identification of newly isolated strains. Furthermore, slight variations in experimental technique produce such extensive modifications in growth and biological characters that many of the older descriptions require careful interpretation before being assigned to their places in more modern systems of classification.

RE (S.). **Note on the permanency of the fermentative characters of certain species of Monilia.**—*J. trop. Med.* (*Hyg.*), xliii, 10, pp. 137–138, 1940.

A table is given showing the results of a recent study of the fermentative characters of *Monilia* [*Candida*] *krusei*, *M.*[*C.*] *pinoyi*, *M.*[*C.*] *tropicalis*, *M. guilliermondi* [*R.A.M.*, xix, p. 18], *M.* [*or C.*] *pseudotropicalis* [ibid., xix, p. 16], and *M.*[*C.*] *macedoniensis*, all of which remain exactly as when originally isolated by Castellani in 1909–10 [ibid., xvi, p. 99 *et passim*].

SAGGESE (N.). **Contributo allo studio delle micosi umane : le mycotorulosi intestinali infantili.** [A contribution to the study of the human mycoses: the infantile intestinal mycoses.]—*Riv. Clin. pediat.*, xxxviii, 1, pp. 1–35, 1940.

This is a critical discussion of the clinical and mycological aspects of seven cases of infantile intestinal disorders examined at the Children's Hospital, Pisa, and attributed in six to primary infection by *Mycotorula* [*Candida*] *albicans*, associated in one patient with *Mycocandida* [*C.*] *pseudotropicalis* and *Pichia chodati*; in another case *Rhodotorula mucilaginosa* and *C. pseudotropicalis* were isolated (identifications of Prof. O.

Verona). *C. albicans* and *C. pseudotropicalis* were pathogenic to rabbits (the former more strongly than the latter), the other two organisms innocuous. There is considered to be no doubt that *C. albicans*, at any rate, is an important etiologic agent in the intestinal disturbances of children.

De Almeida (F.) & Lacaz (C. Da S.). **Considerações sobre um caso de blastomicose cutaneo-mucosa.** [Considerations on a case of cutaneous-mucous blastomycosis.]—*Ann. paulist. Med. Cirurg.*, xxxviii, 4, pp. 285–292, 6 figs., 1939. [English summary.]

Following a concise survey of F. L. Niño's recent classification of the blastomycoses into three groups (*Prensa méd. argent.*, xxv, 47, 1938), viz., blastomycoses *sensu stricto*, produced by true yeasts; parablastomycoses, due to fungi not properly to be classed as yeasts botanically speaking, but simulating them in the development of budding cells; and pseudo-blastomycoses, caused by organisms in which the budding phase of reproduction is lacking, the authors describe a case of the first group characterized by infection of the lower lip and oral mucus and also of the right hand in a male patient at the Faculty of Medicine, University of São Paulo, Brazil. A species of *Candida*, with budding cells 3 to 5 μ in diameter, was isolated from the diseased tissues.

Gray (F. C.). **Two cases of Torula meningitis with special reference to the laboratory findings.**—*S. Afr. med. J.*, xiv, 4, pp. 65–70, 5 figs., 1940.

A detailed account is given of two fatal cases of *Torula* infection of the central nervous system (*T. histolytica* or *Debaryomyces hominis* [*D. neoformans*: *R.A.M.*, xviii, p. 800]), one in a European woman and the other in a male Eurafrican, both at Port Elizabeth, this being only the third record of the disease in South Africa. In the first case tuberculous meningitis was simulated and the correct diagnosis was made only after autopsy; in the second the etiological agent was recognized by the morphological and cultural characters of the yeast cells, 5 μ in diameter, found in the cerebrospinal fluid. The organisms from both cases were pathogenic to white mice, whether injected in cerebrospinal fluid or as cultures.

Fröhlich (W.), Zach (F.), & Piringer (W.). **Über ein der Noma ähnliches Bild hervorgerufen durch Blastodendrion palati.** [On a syndrome resembling noma induced by *Blastodendrion palati*.]—*Arch. Derm. Syph., Berl.*, clxxix, 5, pp. 521–530, 8 figs., 1939.

German and Latin diagnoses are given of *Blastodendrion palati* n.sp., isolated on various standard media at the Vienna University Dermatological Clinic from a fatal case of blastomycosis, commencing with an abscess of the palate, in a 24-year-old man. The dimensions of the spherical, oval, ovate, or elliptical cells, staining red with Sudan III, varied with the medium, averaging 4·7 to 5·9 and 4·7 to 5·3 μ in diameter, respectively, on bouillon glucose peptone agar and carrot, the two most suitable substrata, at 37° C. On liquid media the cells were much larger, with diameters ranging from 6·5 to 15·2 μ. The thick-walled resting cells measured 6·7 to 8·7 μ. Intermingled with these

elements were numerous elongated cells and very long, filiform budding forms simulating a true mycelium. Gelatine was slowly liquefied, acid produced, and maltose and glucose fermented, but milk was not coagulated.

FAZAKAS (A.). **Pilzbefunde in den Tränenkanälchen, an den Augenlidern und den Lidrändern.** [Fungi detected in the lacrimal canaliculi and on the eyelids and their margins.]—*Klin. Mbl. Augenheilk.*, civ., 1, pp. 59–63, 1940.

Among the fungi observed by the writer in the course of ocular examinations at a military hospital at Debrecen, Hungary, were *Glenospora clapieri* [*R.A.M.*, xviii, p. 178], *Trichosporum rugosum*, *Monosporium* [*Scedosporium*] *apiospermum* [loc. cit.], *Schizosaccharomyces* [or *Mycoderma*] *hominis* [ibid., xvii, p. 242], *Scopulariopsis brevicaulis* [ibid., xvi, p. 179], *Haplographium de bella-marengoi* [ibid., xvi, p. 253], *Hormodendrum algeriensis* [*H. pedrosoi*: ibid., xviii, p. 523; xix, p. 406], and *Cladosporium herbarum*, of which the first three each occurred in one case only and the remaining five species in 12, 4, 11, 2, and 6, respectively. In 47·7 per cent. of the cases the organisms were associated with some kind of pathological condition. Three cases in which the Meibomian glands of the eyelids were involved were found to be due to (1) *Microsporon felinum*, *T.* sp., and *Achorion* sp.; (2) *Acrothecium hominis*; and (3) *Acrostalagmus cinnabarinus* [ibid., xiii, p. 769].

NIÑO (F. L.). **Estudio de las lesiones producidas en el sistema ganglionar linfatico por le 'Paracoccidioides brasiliensis'.** [A study of the lesions produced in the ganglionar lymphatic system by *Paracoccidioides brasiliensis*.]—*Arch. Soc. argent. Anat. norm. pat.*, i, 4, pp. 221–231, 17 figs., 1939.

This is a detailed account of the histology of the lesions produced by *Paracoccidioides brasiliensis* in the human ganglionar lymphatic system in the Argentine [*R.A.M.*, xviii, p. 800].

VAN DER WALLE (N.). **Coccidioidomycosis.**—*Ned. Tijdschr. Geneesk.*, lxxxiii (iv), 47, pp., 5548–5554, 1 pl., 1 graph, 1939. [Dutch.]

The author summarizes some important contributions to the literature dealing with *Coccidioides immitis* in California [see next abstract], and adds a note on the occurrence of *Paracoccidioides brasiliensis* [see preceding abstract] in Brazil, in which it is stated that the new name for the latter fungus is *Lutziomyces heterosporocellularis*.

YEGIAN (D.) & KEGEL (R.). **Coccidioides immitis infection of the lung. Report of a case resembling chronic pulmonary tuberculosis.**—*Amer. Rev. Tuberc.*, xli, 3, pp. 393–397, 7 figs., 1940.

Coccidioides immitis was isolated on Sabouraud's medium (P_H 4) at 37° and on a liquid medium of sodium chloride, dextrose, and yeast extract (P_H 4) from the sputum of a 25-year-old woman at a New York hospital. The clinical history of the case suggested that infection was probably acquired before the patient's fourteenth year during a visit to the San Joaquin Valley, California [*R.A.M.*, xix, p. 472].

BATTA (G.) & FABRY (L.). **La protection des sacs de Jute.** [The protection of Jute bags.]—*Chim. et Industr.*, xliii, 7, pp. 535–538, 1940.

In experiments conducted at the University of Liége, Belgium, untreated jute fibres suffered an appreciable diminution of strength from mould (*Penicillium*, *Aspergillus*, and *Mucor*) infection in less than a fortnight, whereas material impregnated with a commercial antiseptic [unspecified] was not attacked [cf. *R.A.M.*, xix, p. 95]. It is estimated that a trebled or quadrupled duration of life may be anticipated as a result of appropriate protective measures.

BARKER (S. G.). **Deterioration of Jute.**—*Jute Rev.*, xiii, 139, p. 5; 140, p. 5, 1940.

Some of the information in this paper regarding the deterioration of the jute used for sandbags [see preceding and next abstracts] in England was placed at the author's disposal by [A. C.] Thaysen, of the Chemical Research Laboratory. In one test the periods (in days) of soil exposure required for the complete breakdown of jute samples shielded by glass, aluminium, rubber, and vaseline were 119, 105, 105, and 32, respectively, compared with 28 for the untreated. In active garden soil dew- and water-retted flax, hemp, jute, and cotton decayed in 20, 20, 21, 35, and 14 days, respectively, the rate of deterioration being roughly inversely proportional to the weights of the fabrics (4·42, 4·42, 4·42, 7·47, and 1·78 gm. per 100 sq. cm., respectively). It is thus apparent that jute is superior, from the point of view of resistance to rotting, to most of the other possible materials, besides being cheaper.

In another experiment in which jute wool sheets were exposed to the action of soil, the strongest protective influence was exercised by acetylation: this process conferred immunity from the complex of microbiological agents co-operating with climatic conditions to induce deterioration for a period of 2,645 days compared with 45 for the untreated control samples, a ratio of 58·8 : 1. Good results were also given by chromium/cutch, proflavine, acriflavine, and copper naphthenate [*R.A.M.*, xvi, p. 430], with protective prolongation ratios of 2·4 : 1 for the first three and 2·2 : 1 for the fourth. Resistance to sea water (tested in a few instances only) was strengthened by treatment with copper oleate (2·8 : 1) [ibid., xv, p. 505] and shielding with latex (2·1 : 1).

Rotting of Flax and Hemp fabrics.—*Jute Rev.*, xiii, 5, p. 13; 6, p. 13, 1940.

In connexion with Prof. Barker's investigations on the reaction of processed jute to fungal infection [see preceding abstract], some figures recently published by the German Fibre Research Institute relating to similar tests on flax and hemp are reproduced. Samples of sandbag fabrics made from flax and hemp tow yarns were (1) exposed to day and night weathering for six months at different places. Others were (2) stored in moist sand at 20° C. and a further lot (3) in an atmosphere of 80 to 90 per cent. relative humidity and a temperature of 18° to 20°, part of each lot being impregnated with copper sulphate and part left untreated. In lot (1) the first signs of mould appeared after one month and gradually increased until considerable infection was present at the end

of six months. In (2) the untreated samples were covered with fungi after one month and completely destroyed at the end of three months, while the impregnated, though severely attacked after three months, still showed adequate strength. As regards (3) the controls were heavily moulded after three months, while the treated samples remained free for six. There was no difference between flax and hemp in respect of resistance to fungal invasion, but the latter gave higher values than the former in bursting tests.

HAWKER (LILIAN E.). **Experiments on the control of basal rot of Narcissus bulbs caused by Fusarium bulbigenum Cke & Mass. with notes on Botrytis narcissicola Kleb.**—*Ann. appl. Biol.*, xxvii, 2, pp. 205–217, 1940.

In further experiments on the basal rot of narcissus (*Fusarium bulbigenum*) [*R.A.M.*, xv, p. 224] it was shown that rotting was favoured by high storage temperatures. Artificially infected bulbs of a number of narcissus varieties showed, after six weeks' storage, 6·9 per cent. losses in the shed (usually 0° to 17° C.) and 66·8 per cent. at 27°; artificially and naturally infected bulbs stored in a cool cellar (15° to 18°), in a shed (12° to 26°), and at 27°, showed 7·5, 12·4, and 22·7 per cent. losses, respectively. Bulbs infected with *Botrytis narcissicola* [ibid., xix, p. 97], on the other hand, showed heavier losses at lower than at higher temperatures. Rapid drying of the bulbs after lifting and after hot-water treatment reduced the rotting due to *F. bulbigenum*. In wet seasons drying is facilitated by partial cleaning of the bulbs soon after lifting. None of the bulbs thus cleaned showed any injury. After cleaning, bulbs should be stored under conditions of good ventilation at temperatures below 18°. In confirmation of the view generally held by the growers, late-planted bulbs gave poor stands in the field. The beneficial effect of early planting is ascribed to the fact that bulbs planted in September often experience lower temperatures than when kept in the warehouse. The addition of formalin (0·5 per cent.) or uspulun (0·25 per cent.) to the hot-water bath used as routine treatment to control eelworm [ibid., xviii, p. 653] or dipping in a cold solution of the former fungicide for five minutes after hot-water treatment, resulted in a reduction of the number of bulbs rotted during subsequent storage. This reduction was greater in bulbs free from eelworm. No adverse effects on growth and flowering were produced when the treatment was carried out at the correct time, namely, late August. Treatment with cold fungicidal steeps (0·5, 1·0, and 5·0 per cent. formalin, 0·1 per cent. mercuric chloride, 0·25 per cent. uspulun, or 0·25 per cent. aretan) or dusts (ceresan, improved ceresan, folosan, or brassisan, usually diluted to one-fourth with talc) soon after lifting also reduced rotting by *F. bulbigenum*, and had, with two exceptions (improved ceresan and 0·5 per cent. cold formalin), no harmful effect on growth or flowering.

DIMOCK (A. W.). **Epiphytotic of Botrytis blight on Gladiolus in Florida.**—*Plant. Dis. Reptr*, xxiv, 8, pp. 159–161, 1940. [Mimeographed.]

In March, 1940, the author received gladiolus plants from the vicinity of Bradenton, Florida, showing small, water-soaked lesions on the blossom petals (the tips of many of which were completely dried and

withered), light green or yellow spots about 1 mm. in diameter and with a reddish dot at the centre on the leaves, and sunken, brown lesions 1 to 4 by about 1 mm. on the stems. A *Botrytis* of the *cinerea* type was isolated from the material. The damage was reported to be very widespread, the grower who sent the specimens having lost at least 15,000 dozen gladiolus plants, while the same condition had developed on roses, camellias, gardenias, sweet peas, snapdragons [*Antirrhinum majus*], lettuces, cabbages, celery, and cauliflowers. In April a more severe outbreak occurred at Fort Myers, Florida. In conditions of high humidity and temperature the disease spread very rapidly over entire plantings in all stages of growth. This appears to be the first report of *Botrytis* blight on gladiolus in epidemic proportions in the United States.

LONGRÉE (KARLA). **Coniothyrium fuckelii Sacc. on Rose leaves.**—*Phytopathology*, xxx, 5, pp. 451–452, 1 fig., 1940.

In experiments at the New York (Cornell) College of Agriculture, young Joanna Hill rose leaves kept floating for seven days on a sucrose solution after inoculation with *Diplocarpon rosae* revealed the pycnidia of *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: *R.A.M.*, xvii, p. 600; xix, p. 348] within the black spot lesions. The fungus was isolated and inoculated into rose canes, on which it produced typical stem and graft cankers. Uninjured young Joanna Hill and Talisman rose leaves inoculated with *L. coniothyrium* were unaffected after a fortnight in environmental conditions favourable to the fungus, whereas those artificially infected with a mixture of *L. coniothyrium* and *D. rosae* spores bore pycnidia of the former intermingled with acervuli of the latter within the black spot lesions. Evidently, therefore, *L. coniothyrium* is capable of fruiting on rose leaves previously attacked by *D. rosae*.

ROSEN (H. R.). **The Arkansas Rose-disease report.**—*Amer. Rose Annu., 1940*, pp. 119–122, 1940.

In experiments in the control of black spot of roses (Edith Nellie Perkins and Betty Uprichard varieties) [*Diplocarpon rosae*: *R.A.M.*, xviii, pp. 440, 598, and above, p. 519] at the Arkansas Agricultural Experiment Station in 1939 the incidence of infection was reduced from between 55 and 95 per cent. to 3 to 35, 1 to 30, and 5 to 10 per cent., respectively, by sulphur dust (kolotex), rose dust No. 1 (4 per cent. cuprocide G–A, 10 per cent. flour, 2 per cent. calcium arsenate, and 84 per cent. talc), and rose dust No. 2 (same as the preceding except for the replacement of the arsenate by talc). Kolotex caused slight burning on all the plots, while the copper oxide dusts were free from this drawback.

Breeding work for resistance to *D. rosae* is greatly complicated by regional inconsistencies in varietal reaction to the fungus, the repeatedly resistant Hybrid Wichurianas, Mary Wallace, Dr. W. Van Fleet, and Silver Moon, for instance, being quite susceptible in the Ozark district. So far, the few types and varieties showing uniform resistance are confined to the species roses and some of the *Rugosa* group.

Weiss (F.). **Anthracnose and Cladosporium stem spot of Peony.**—*Phytopathology*, xxx, 5, pp. 409–417, 1 fig., 1940.

A red spot disease of the stems, foliage, and flowers of peony, for which the writer in a previous note suggested the name of 'measles' (*Plant Dis. Reptr*, xvi, pp. 122–123, 1932), is stated to be prevalent in commercial plantings in the United States, sometimes seriously disfiguring the plants and destroying their value for cutting. The stem spots are raised, elliptical to elongated, usually discrete but occasionally confluent, 2 to 4 by 1 to 2 mm., while those on the leaves, floral bracts, and petals are much smaller, some mere flecks; all are of a uniform purplish- or brownish-red. Isolations from the diseased tissues of Avalanche peonies in a Pennsylvanian planting yielded *Cladosporium paeoniae* [*R.A.M.*, xviii, p. 478], *C. herbarum* [ibid., xvi, p. 464], a species of *Alternaria*, and *Glomerella* (?) *cingulata*, while stored stems kept outdoors or in a 10° C. chamber yielded in the late winter pycnidia of a fungus identified as *Pezizella lythri* [ibid., xi, p. 252], the imperfect stage of which is *Sclerotiopsis concava* (*Mycologia*, xiii, pp. 135–170, 1921), *S. testudinea* (ibid., xviii, p. 253, 1926) being probably a synonym. *S. concava*, also collected on several subsequent occasions in the field and isolated from the first red spots on peony stems in May, 1939, proved in inoculation experiments to be definitely parasitic, though the resulting symptoms, including stem collapse and the production of large, light brown foliar lesions bearing copious sporodochia of *Hainesia lythri* [ibid., xi, p. 252], were by no means characteristic of the disease as it occurs in nature. On the other hand, the typical features of red spot developed in plants inoculated with *C. paeoniae*, which was reisolated on maize meal agar, together with its *Pseudofumago* budding phase [ibid., ix, p. 346], from the lesions. In the latter stage the fungus is also pathogenic to peonies at a temperature range of 10° to 27·5° (optimum 18° to 22°), the dry, light brown spots on the leaves resembling those due to *Pezizella lythri*. It would appear from these results that *C. paeoniae* is the principal etiological factor in the development of red spot of peonies. Three outbreaks of the disease coincided with abnormally high spring temperatures. Infection is perpetuated chiefly by old diseased stems, and thick-stemmed varieties, such as Festiva Maxima and M. Jules Élie, appear to be much more resistant to red spot than weak-stemmed and medium or dwarf kinds.

Weiss (F.) & Smith (F. F.). **An incubating can for laboratory or field use.**—*Phytopathology*, xxx, 5, pp. 447–449, 1 fig., 1940.

Tin-plated or lacquered cans, fitted with vials buttressed with paraffin to form an even slope from the mouth of the vial to the bottom of the container, have been successfully used for incubating flowers inoculated with *Ovulinia azaleae* [*R.A.M.*, xix, p. 412] and are also applicable to experimental inoculations with other pathogens. A twig bearing one to four, usually two, flowers is inserted in the vial, which is filled with water from a rubber syringe, and a piece of paper towel placed on the bottom of the container to absorb excess water. Freshly cut flowers remained in good condition in the containers for 8 to 12 days, an ample period for the requisite observations.

DODGE (B. O.). **Fern diseases and pests.**—*J.N.Y. bot. Gdn.*, xli, 485, pp. 116–117, 1 fig., 1940.

Notes are given on the following prevalent diseases of ferns [*R.A.M.*, xvii, p. 462] in the United States: damping-off of the prothallia due to *Pythium*, *Rhizoctonia*, and *Botrytis* spp., the spores of which are perpetuated in the soil (and in the case of the first-named in water supplies originating in lakes or ponds); a yellowish-brown, jagged spotting of the prothallia caused by *Completoria complens* [ibid., xvii, p. 182]; reddish-brown or ashen, later brown lesions on the fronds due to various fungi, including *Cylindrocladium pteridis*, *Phyllosticta pteridis*, and *Alternaria polypodii* (the last-named producing zonate spots along the margins and forming tufts of loosely concatenate, brown spores); a species of *Taphrina* [ibid., xviii, p. 141] producing well-marked, yellow areas on both sides of the leaflets of Christmas fern [*Polystichum acrostichoides*], occurring occasionally from Maine to North Carolina and controllable (like the other leaf spots mentioned) by spraying with Bordeaux mixture; and black moulds (*Fumago* and *Teichospora* spp.).

HEIM (R.). **Apparition de la rouille des Aloës à Madagascar.** [Appearance of Aloe rust in Madagascar.]—*Rev. Bot. appl.*, xx, 223, pp. 172–176, 2 figs., 1940.

Introduced species of aloes (*Aloë saponaria* and *A. thraskii*) in the Botanical Gardens at Antananarivo were found to be attacked by *Uromyces aloës* (Cke) P. Magn., a new record for Madagascar. Native aloes growing in the same rockeries were unaffected. On *A. saponaria* (which succumbs to infection) the fungus develops on the leaves, on which it produces round or oval, yellow spots, up to 5 cm. in diameter, bearing pustules arranged in broken, concentric circles. On *A. thraskii* similar effects are produced.

The teleutospores are generally globulose, oval, or irregularly subpolygonal, sometimes lozenge-shaped and elongated towards the apex, 31 to 44 by 28 to 34 μ. The pedicel is hyaline, 5 to 6 μ by up to 110 μ or more. The plasma is reddish-brown and granular. Repeated examination showed the presence of teleutospores only. Infection appeared to be associated with reduced resistance of the host due to re-transplanting, extreme drought, and nutritional deficiency.

WILSON (M.), NOBLE (M[ARY]), & GRAY (E. G.). **Blind seed disease of Ryegrass.**—*Nature, Lond.*, cxlv, 3681, p. 783, 1940.

After pointing out that blind seed disease of rye grass [*Lolium perenne* and *L. italicum*] has been present in Great Britain for at least four years, and (since the true perennials are very susceptible) is of considerable economic importance, the authors state that when Miss Noble's recent paper was written, describing a *Pullularia* on infected seed [*R.A.M.*, xix, p. 23], that by Neill and Hyde [attributing the blind seed disease to a fungus allied to *Helotium herbarum*: ibid., xviii, p. 601] was unavailable to her. The two fungi are, under certain cultural conditions, very similar, and it is thought advisable to record the fact that, in Britain, the blind seed fungus and the *Pullularia* sp. are often found on one and the same rye-grass seed.

Brown (B. A.). **Boron deficiencies in Connecticut.**—*Science*, N.S., xci, 2362, p. 338, 1940.

During the dry summer of 1939, the top leaves of lucerne at the Storrs (Connecticut) Agricultural Experiment Station turned yellow and the buds failed to develop into flowers on all the plots except those supplied with borax at the rate of 20 lb. per acre [*R.A.M.*, xvii, p. 398] in the previous August. At the second cutting the treated plants yielded 16 per cent. more than the controls, and chemical analyses revealed the following amounts of boron (p.p.m.): with borax, leaves 62 and stems 22; without borax, 21 and 16, respectively. Lucerne 'yellows' was further observed on several farms in the State during 1939, while another boron deficiency disease, internal cork of apples [ibid., xix, p. 416] was also reported in the same season.

Ayers (T. T.), Lefebvre (C. L.), & Johnson (H. W.). **Bacterial wilt of Lespedeza.**—*Tech. Bull. U.S. Dep. Agric.* 704, 22 pp., 13 figs., 1939. [Received July, 1940.]

A comprehensive account is given of the writers' studies on an apparently new bacterial wilt of *Lespedeza stipulacea* and *L. striata*, first observed at the Arlington Experiment Farm, Virginia, in 1937, and since then traced also to Missouri, Kansas, Illinois, Tennessee, and New York.

Dark, water-soaked spots on the leaflets are the first external sign of infection, rapidly followed by a greyish-brown discoloration, desiccation, and curling of the foliage, a thin incrustation of bacterial exudate sometimes covering the affected surfaces. Susceptible strains of the host succumb to the systemic invasion of the pathogen, which ensues soon after the premonitory symptoms. The stems of infected plants are liable to crack and extrude a yellowish drop of liquid which hardens. The organism isolated from the diseased tissues is named *Phytomonas lespedezae* n.sp. and described as a rod with rounded ends, occurring singly, in pairs, or occasionally in short chains, averaging 1·62 by 0·56 μ, motile by one polar flagellum, Gram-negative, aerobic, making the best growth between 30° and 35° C., and provided with capsules but no spores; on nutrient agar plates the bacterium forms circular, raised, glistening, translucent, viscid, yellow colonies, with entire margins; development is more copious on potato dextrose agar and potato cylinders; nutrient broth is clouded in 48 hours; gelatine, egg albumin, and blood serum are liquefied, milk peptonized, starch hydrolysed, and indol and hydrogen sulphide formed, but nitrates are not reduced and neither acid nor gas evolved from any of the carbohydrates tested.

Greenhouse inoculations showed the following annual strains of *L. stipulacea* to be susceptible: two of Early Korean, Harbin (all severely attacked), Late Korean (moderately), and Standard Korean (mildly); and *L. striata*, Tennessee (severely,) Kobe (moderately), and two of Common (one moderately to severely, the other mildly). So far perennial species have sustained no damage in the field, but the following were susceptible in inoculation experiments: *L. capitata*, *L. daurica*, *L. frutescens* [*L. violacea*], *L.* [*juncea* var.] *inschanica*, *L. procumbens* [*L. repens*], *L. sericea*, and *L. virginica* [*L. sessiliflora*]; on the other hand, a high degree of resistance was shown by *L. formosa* [*Desmodium*

formosum], *L. hirta* [*L. villosa*], *L. latissima*, and *L. thunbergii*. A strictly localized infection round the site of injury was the only response to inoculation with *P. lespedezae* of a number of other Leguminosae tested, including white sweet clover (*Melilotus alba*). Three methods of inoculation were successfully used on *L.* spp., viz., pricking the leaves with a needle dipped in a bacterial suspension, cutting seedling roots during immersion in the same, and cutting across the young leaflets, followed by immediate dipping in the suspension; atomizing with the latter resulted in infection only in the case of young seedlings with just the primary leaves exposed, the entry of the pathogen apparently being effected through the stomata. Once the parasite gains a foothold in a susceptible host it soon invades the vascular system and travels rapidly through the plant, obstructing the water-conducting vessels and causing wilting and death.

P. lespedezae was experimentally shown to occur both on and in the seed of the Early Korean variety of *L. stipulacea*, and in this way the pathogen may both persist in established fields (which it also does on diseased plant refuse) and be introduced into new areas. The use of healthy seed is thus the most urgent control measure, while the development, by selection or hybridization, of resistant lines from Standard Korean and Common may eventually have to be considered.

MARCHIONATTO (J. B.). **Argentine Republic. Coryneum carpophilum on fruit trees.**—*Int. Bull. Pl. Prot.*, xiv, 5, p. 99, 1940.

Proof is stated to have been obtained by Clotilde Jauch in field and laboratory studies on the blight of stone fruits (peach, apricot, almond, plum, and cherry) in various localities of the Argentine Republic with widely differing climates that the causal organism belongs to the genus *Coryneum*. On the advice of other workers on the same fungus she proposes to rename it *Coryneum carpophilum* (Lév.) nov. comb. [syn. *Clasterosporium carpophilum* (Lév.) Aderh.].

HOPKINS (J. C. F.) & BACON (ALINE L.). **Diseases of fruit, flowers, and vegetables in S. Rhodesia. I. Common diseases of Apples and their control.**—*Rhod. agric. J.*, xxxvii, 5, pp. 264–281, 4 pl., 1940.

This is a reprint of the authors' earlier paper on apple diseases and their control in Southern Rhodesia [*R.A.M.*, xvii, p. 755] with the addition of further information obtained during the past three years [ibid., xviii, p. 784; xix, p. 197], and a revised spray schedule.

Recommendations for the control of crown gall (*Bacterium tumefaciens*) [cf. ibid., xvii, pp. 508, 755] consist in planting only healthy nursery stock, soaking all new nursery stock for two hours just before planting (but not immediately after fumigation) in copper sulphate (7 oz. per 20 gals. water), uprooting and burning all infected trees (including stone fruits), or, if only slightly infected, removing the galls and painting the wounds with carbolineum, and soaking the soil from which diseased trees have been removed in formalin (1 in 25), leaving the hole unfilled for one year.

Root rot (*Sclerotium rolfsii*) is sometimes troublesome in nurseries where the soil is allowed to become too wet, but can generally be eliminated by improved drainage. Badly affected trees should be removed and burnt.

Carne (W. M.). **Australian Apples. A guide to picking for export or local storage and to the best shipping periods for export varieties.** —*Pamph. Coun. sci. industr. Res. Aust.* 95, 55 pp., 1 graph, 1940. [Photolithographed.]

The contents of this pamphlet embody an introductory note by W. M. Carne and five papers by the same author, some in collaboration with D. Martin and E. N. Robinson, which may be summarized as follows.

The incidence of storage and similar defects in apples is closely related to the average size of the fruit on a tree at the opening of the picking season. The larger the average size, i.e., the lighter the crop, the stronger is the tendency to the defects of the given variety. Small fruits of light crops are more liable to deterioration than those of heavier crops grown under comparable conditions. Such inherent defects cannot be avoided by earlier picking to prevent increase in size. Commercial experience has led to the acceptance as the standard size for any variety exported to the United Kingdom of the largest dimensions compatible with good keeping qualities, e.g., $2\frac{1}{4}$ in. for Cox's Orange Pippin, $2\frac{3}{8}$ to $2\frac{1}{2}$ for Jonathan and Cleopatra, and $2\frac{1}{2}$ to $2\frac{5}{8}$ for Granny Smith. Light-crop fruit has a shorter storage life and a briefer picking season than heavy-crop, and is never suitable for export. Carefully picked light-crop fruit (except very large individual apples) may be placed in cool storage for short periods and marketed direct from store. Before the picking season opens, all trees with about half a crop or less should be marked. The fruit should be picked early if the variety is subject to breakdown, late if susceptible to bitter pit, and towards the middle of the season if liable to both disorders. The optimum picking and shipping dates for Tasmanian apples are given.

The available knowledge concerning brown heart [*R.A.M.*, xvii, p. 463] is summarized. The safe concentration of carbon dioxide is about 10 per cent. up to a period of seven days, with lower concentrations for longer periods down to 3 per cent. for eight weeks. Normally it is desirable to aim at a maximum of 3 per cent. In 1939 the following percentages of severe brown heart were recorded for Tasmanian Sturmers picked on 17th April and stored in the presence of 5 per cent. carbon dioxide: after four weeks at 33° F., 0; after a fortnight at room temperature, 35; in 10 per cent. carbon dioxide under the same conditions, 8 and 52, respectively; the corresponding values for fruit picked on 12th May and similarly treated being 4 and 68, 52 and 84. The danger of using grid-cooled boats (the substitution for which of battery-cooled ships' holds is desirable, but at present impracticable) can be greatly minimized by picking the fruit during the first week of May and immediately storing it to await shipment.

Tables are given showing the recommended dates for the commencement of picking for export or local storage and for the export periods of apples from the six States of the Commonwealth.

Hill (H.) & Johnston (F. B.). **Magnesium deficiency of Apple trees in sand culture and in commercial orchards.**—*Sci. Agric.*, xx, 9, pp. 516–525, 4 figs., 1940.

During the past two years severe cases of magnesium deficiency have been observed in commercial apple orchards in Canada [cf. *R.A.M.*,

xviii, p. 743]. Early in August, 1938, typical symptoms were noted in one of the largest apple-growing centres in Quebec. Heavy, leaching rains had fallen at the beginning of the growing season. The condition was general throughout the district, and in many instances was very severe. The Melba variety was badly attacked, the symptoms being identical with those observed on this variety in sand culture experiments, viz., yellowing beginning round the leaf margins and spreading towards the midrib, the veins and a small area next to them remaining green, and the effect being one of radiating, narrow, green and wide, yellow bands. The yellow bands died and turned brown. On Fameuse and McIntosh apples marginal blotches and interveinal bands of necrotic tissue were more noticeable than interveinal bands of chlorotic tissue. By early September many of the older leaves showed large areas of dead tissue. Such leaves became rolled, and premature defoliation occurred. On Lawfam apples, interveinal chlorosis was followed by bleaching of the entire leaf, dead, necrotic areas occurring on the margin or in the centre.

The condition occurred on dark brown loam, very acid soils, occasionally with traces of podsolization, with a surface soil rich in organic matter and total nitrogen, low in calcium and magnesium, and with a satisfactory potassium level.

Leaves from affected trees had a very low magnesium content, a normal phosphorus and calcium content, and a rather higher potassium content than leaves from average normal trees. Evidence indicated that the condition may perhaps increase the susceptibility of apple foliage to spray injury. Soil applications of magnesium sulphate, sulphate of potash magnesia, and dolomite limestone did not affect the magnesium content of the leaf petioles or the terminal shoots or prevent the disorder from occurring in the year the applications were made.

CASS-SMITH (W. P.). **Black spot or scab of Apples. Serious new outbreaks recorded in the Albany and Manjimup districts.**—*J. Dep. Agric. W. Aust.*, xvii, 1, pp. 56–67, 6 figs., 1940.

Apple scab, *Venturia inaequalis*, is stated to have been recorded now from all States of Australia [*R.A.M.*, xix, p. 104]. Serious new outbreaks occurred in a number of orchards in Western Australia during 1939–40, but owing to the disease being detected early measures were immediately and effectively carried out by the growers with the assistance of the Department of Agriculture. The following is a typical central programme: all trees in the infected area and the ground beneath were sprayed with home-made Bordeaux mixture 6–6–40 plus calcium caseinate, flour, or skim milk as a spreader, and a buffer area around the affected trees sprayed with Bordeaux mixture 3–5–50 plus spreader; all infected fruits and leaves were destroyed; after harvest, all trees and the ground beneath were to be sprayed with Bordeaux mixture 6–6–50; no fruit from the orchard to be allowed to leave it without permission from the inspector; early in April a cover crop of oats, rye, or barley was to be sown throughout the orchard to prevent diseased leaves from being blown about, the cover crop to be deeply ploughed under in autumn; in spring all trees in the orchard to be sprayed at (1) the 'spur burst' stage, when the tips of the young leaves

are showing, with Bordeaux mixture 5–4–50 plus spreader, (2) the 'pinking' stage of blossoming before the petals had opened with Bordeaux mixture 3–4–50 plus spreader, and (3) the 'petal fall' stage with Bordeaux mixture 2–5–50 plus spreader. It has been proved that infection is being introduced into Western Australia on young apple trees imported from the eastern States. It has now been arranged by the Department of Agriculture that all apple trees imported into Western Australia shall be dipped into Bordeaux mixture before being distributed to growers.

The development of the disease is favoured by fairly cool, moist weather during the growing season. The disease is undoubtedly capable of persisting under extremely adverse conditions. The following varieties of apples, listed in declining order of susceptibility, were found affected with the disease: Cleopatra, Granny Smith, Yates, Dougherty, Dunn's, Jonathan, and Delicious. All growers in the vicinity of the new outbreaks are urged to be constantly on the watch for symptoms and are advised to adopt as a precaution the control measures that have been applied in affected orchards.

WORMALD (H.). **Storage scab of Apples.**—*Gdnrs' Chron.*, cvii, 2787, p. 257, 2 figs. (1 on p. 255), 1940.

In February, 1940, severe storage scab (*Venturia inaequalis*) was observed on Cox's Orange Pippin apples on removal from gas storage, conditions in which are evidently equally favourable for the development of the fungus with those of ordinary cold storage [*R.A.M.*, xiv, p. 111]. In addition to routine spraying in the orchard with Bordeaux mixture or lime-sulphur, followed if necessary by supplementary treatments with colloidal sulphur or sulphur dust, the removal of all surface moisture from the fruits before storage is an important means of combating this phase of scab.

KEITT (G. W.) & LANGFORD (M. H.). **A preliminary report on variability and inheritance in Venturia inaequalis.**—*Phytopathology*, xxx, 5, pp. 452–453, 1940.

At the University of Wisconsin the eight ascospores of each of four asci of *Venturia inaequalis* were isolated in the order of their occurrence in the ascus and grown on malt agar through twelve consecutive monoconidial transfers made at two-monthly intervals. The distinctive morphological characters of the thalli remained fairly constant in culture. Each set of eight isolates contained four pairs behaving alike, indicating that the third nuclear division in the ascus is equational.

The pathogenicity of all the cultures on nine apple varieties remained relatively constant during two seasons under approximately identical environmental conditions. In *in vitro* cultures of the ascigerous stage of the fungus, the 32 isolates of the four sets fell into two groups of 16 each for sexual compatibility, being self- and intra-group sterile and inter-group fertile [cf. next abstract]. Segregation for this factor took place alternatively in the first or second nuclear division of the ascus [*R.A.M.*, xvi, p. 684]. The occasional sectors developing in culture [ibid., xv, p. 30] grew faster, produced fewer conidia, and were less pathogenic than the parent isolates. One induced white lesions on

apple leaves. In several instances a sector and its parent isolate were separately paired *in vitro* with the same compatible isolate. The ascocarps from matings between the parent isolates contained eight-spored asci, whereas those from two pairings involving sectors were occupied by four-spored asci, denoting a difference in genetic constitution between the parents and saltants.

LANGFORD (M. H.) & KEITT (G. W.). **Heterothallism in Venturia pirina.**—*Phytopathology*, xxx, 5, p. 452, 1940.

The eight spores of each of five asci of *Venturia pirina* were isolated in the order of their occurrence in the ascus and grown *in vitro* at the University of Wisconsin. Petri dishes containing 20 c.c. each of 0·5 per cent. malt extract agar plus a decoction of dead pear leaves were sown with conidia of these isolates, singly and in every possible combination within each set of eight, similar sowings being made on sterilized dead pear leaves in test tubes with a few c.c. of malt extract decoction. The cultures were incubated for four months at temperatures conducive to perithecial development.

All the isolates were hermaphroditic and self-sterile [cf. preceding abstract]. Each set consists of two groups of four isolates each, intra-group sterile and inter-group fertile. Segregation for sexual compatibility occurred alternatively in the first or second nuclear division in the ascus. Matings of the isolates between certain sets disclosed only two compatibility groups.

ANDERSON (H. W.). **Recent developments on eradicant sprays.**—*Trans. Ill. hort. Soc.*, lxxiii (*1939*), pp. 235–247, 1940.

In experiments with eradicant sprays carried out in Illinois, Montmorency and Early Richmond sour cherries were given (26th April, 1939) a 'floor' spray of 2 per cent. elgetol [*R.A.M.*, xix, p. 353] applied at the rate of about 1,400 gals. per acre. On 30th June, only 3·5 per cent. of the leaves on the sprayed trees showed infection by *Coccomyces hiemalis*, as against 43 per cent. for the unsprayed controls. No noticeable leaf fall occurred on the sprayed trees until the middle of August, by which time the controls had developed secondary infection and showed general defoliation.

THORNBERRY (H. H.). **Virus diseases of the Peach.**—*Trans. Ill. hort. Soc.*, lxxiii (*1939*), pp. 247–252, 1940.

Chokecherries (*Prunus virginiana*) in Illinois have been observed to show a condition apparently identical with the yellow-red virosis or 'X' disease of peaches [*R.A.M.*, xix, pp. 292, 484] reported from Connecticut, Massachusetts, and New York. On chokecherry the disease is also present in Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, and Wisconsin. The symptoms differ from those of winter injury in that one or more branches may be reduced in growth, while others remain normal, the trouble not affecting the whole tree as in the latter condition. The disease appears to spread more rapidly on chokecherries than on peaches. In Illinois most of the chokecherries are confined to the north of the State, where there are no commercial peach orchards.

HOPPERSTEAD (S. L.) & KADOW (K. J.). **Studies on the control of the Peach leaf curl.**—*Trans. Peninsula hort. Soc.*, xxix (*1939*), 5, pp. 102–103, [? 1940].

Peach trees in Delaware sprayed on 3rd March, 1939, when the buds had just started to swell, with Bordeaux mixture 6–6–100, 4–4–100, 2–2–100, 1–1–100, and coposil 2–100, showed on 13th May 4·3, 17·8, 24·5, 31, and 32·1 per cent. leaf curl (*Taphrina deformans*) [*R.A.M.*, xix, p. 263], respectively, as against 59·8 per cent. for the untreated controls. Observations in commercial orchards indicated that poor control resulted when sprays were applied after the buds had begun to swell. The disease can be completely controlled in any season, provided each twig, branch, and trunk is completely covered with proper spray material before the buds begin to swell.

SIEGLER (E. A.). **Crown gall of Peach in the nursery.**—*Phytopathology*, xxx, 5, pp. 417–426, 2 figs., 1940.

Crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) is stated to be one of the most serious diseases of nursery peaches, especially in alkaline soils [*R.A.M.*, xviii, p. 158]. Experiments at the Beltsville (Maryland) Horticultural Station in 1939 confirmed previous observations to this effect, the incidence of infection in artificially inoculated limed plots averaging 59 per cent. compared with 9 in the untreated controls. In a test in which pits were dipped before planting in an aqueous suspension of calomel [mercurous chloride] at the rate of 4 oz. per gal., the seedlings from the disinfected material developed only 6 per cent. crown gall as against 71 per cent. in four control plots.

The practice of planting seed after sprouting is another important contributory factor in crown gall formation, though even where the pits are planted in the autumn and allowed to germinate *in situ*, the numerous small lesions occurring on the tender tissues in the early stages of growth appear to act as foci of infection; hence the location of the majority of the excrescences in the region of the root-stem junction.

ASGHAR GINAI (M.). **A species of Phyllactinia occurring on Almond (Prunus amygdalus).**—*Indian J. agric. Sci.*, x, 1, pp. 96–97, 1 pl., 1940.

A species of *Phyllactinia* observed causing mildew of almond leaves and young twigs in the Quetta Valley is identified as *P. salmonii* (syn. *P. corylea* (Pers.) Karst. vars. *angulata*, *rigida*, and *subspiralis* Salmon), described by Blumer [*R.A.M.*, xiii, p. 128] as attacking *Paulownia imperialis* in Japan. The disease first appears at midsummer. Severe attacks (which are rare) induce fragility and slight distortion of the leaves, sometimes accompanied by destruction of the parenchyma and copper discoloration. Sweet almonds are more susceptible than the bitter varieties.

HIENTON (T. E.) & FAWCETT (K. I.). **Precooling tests of Indiana Strawberries, Cantaloupes, and Peaches.**—*Bull. Ind. agric. Exp. Sta.* 439, 36 pp., 13 figs., 8 graphs, 1939.

In tests in which strawberries were despatched from Pekin, Indiana,

to St. Paul, Minnesota ($25\frac{1}{2}$ hours' transit), it was found that fruit shipped in a railway car pre-cooled to 45° F. arrived in excellent condition and showed 1 per cent. decay, as compared with 2 to 3 per cent. decay in a non-pre-cooled car. High initial fruit temperatures should be avoided by picking early in the day and keeping the fruit shaded until it is loaded. Directions are given for adjusting the proportions and quantities of ice and salt to give the best rate of fall of temperature according to conditions at any time.

Tests were also made of the effect of pre-cooling on the development of brown rot [*Sclerotinia fructicola*] in peaches during transit [*R.A.M.*, xviii, p. 535]. In this case it was found that development and spread of brown rot in fruit cooled to below 50° is very slow, being held in check for three days at 45° and four at 41°. Ventilated baskets permit rapid cooling. Pre-cooling makes it possible for the grower to delay harvesting until fruit is fully developed in quality and appearance.

TEMPLE (C. E.). **Red stele rot of Strawberry.**—*Trans. Peninsula hort. Soc.*, xxix (*1939*), 5, pp. 141–149, [? 1940].

Strawberry 'red stele' root rot [*Phytophthora*: *R.A.M.*, xix, p. 107], during the twenty years or so since it was first observed in Scotland, has been reported from 14 of the United States of America and is doubtless present in others. The nursery regulatory services of the States affected are determined to end the movement of infected plants.

In Maryland legislation provides for thorough and repeated inspection of the fields and release of plants only by certification under very strict conditions; this system has given good results after operating for a year. Growers are urged to plough under infected plants as soon as crop failure becomes apparent. Infected fields should not again be planted to strawberries.

In one year's tests the Aberdeen, Beauty, and Pathfinder varieties were found to be highly resistant (possibly immune), and Dunlap (?), Cooper, Gibson, Marshall, Mastodon, Wayzata (Rockhill), Illinois Selection, and New Jersey No. 255 resistant. The Aberdeen variety appears to transmit high resistance to a large proportion of its progenies when crossed with susceptible varieties. In co-operative work between Maryland University and the United States Department of Agriculture about 5,000 hybrid clones have been obtained, one parent of each of which is resistant or immune. These plants are growing in infected soil in two localities and should give valuable new resistant varieties.

WILCOX (MARGUERITE S.). **Diaporthe vaccinii, the ascigerous stage of Phomopsis, causing a twig blight of Blueberry.**—*Phytopathology*, xxx, 5, pp. 441–443, 2 figs., 1940.

Maize meal agar cultures of *Phomopsis vaccinii*, the imperfect stage of *Diaporthe vaccinii*, from naturally and artificially infected blueberry (*Vaccinium corymbosum*) and decayed cranberry fruit [*R.A.M.*, xviii, p. 403], were left out of doors at the Beltsville (Maryland) Horticultural Station from October, 1938, until February, 1939, when all bore occasional small, thick, stroma-like bodies, black on the exterior, partly or wholly embedded in the substratum and containing *Phomopsis* pycnidia and *Diaporthe* perithecia, either together in the same stroma or in

separate stromata. Perithecia-bearing stromata continued to form for some months in these cultures in a refrigerator at 8°, and single-ascus transfers from cultures from spontaneously blighted blueberry shoots later produced the perfect stage (not hitherto observed in nature) at room temperature.

Both the stromata and perithecia of the blueberry isolate appear to agree with Shear's description of *D. vaccinii* [ibid., xi, p. 188]. The asci are oblong, fusoid, sessile, with narrow pores, 32 to 48 by 5·8 to 9·6 μ, containing bicellular, biguttulate spores, 6·4 to 12·8 by 2·5 to 4·2 μ; the elongated, thick-walled ostioles are copiously furnished with upward-tending hairs. The asci of the pathogen isolated from cranberry measured 35 to 45 by 6·4 to 9 μ, and the spores 6·4 to 11·6 by 3·2 to 3·8 μ.

De La Hoz (C.). **El problema Bananero. Tratamiento de la Sigatoka.** [The Banana problem. The treatment of 'Sigatoka' disease.]—*Rev. agríc., Guatemala,* xvii, 3, pp. 98–101, 1940.

Directions are given for the adaptation of Ward's method of combating *Cercospora musae* on bananas in Jamaica with Bordeaux mixture or dust [*R.A.M.*, xviii, p. 328] to Guatemalan conditions [ibid., xviii, p. 124].

Simmonds (J. H.) & Mitchell (R. S.). **Black end and anthracnose of the Banana with special reference to Gloeosporium musarum Cke and Mass.**—*Bull. Coun. sci. industr. Res. Aust.* 131, 63 pp., 2 pl., 1 graph, 1940.

This is a comprehensive account of investigations carried out in Queensland on black end and anthracnose of banana [*R.A.M.*, xii, p. 40; xix, p. 106] for the Australian Council for Scientific and Industrial Research. The fungus *Gloeosporium musarum* is stated to be the sole cause of anthracnose and the most important of all fungi associated with black end. It causes losses throughout the year and is responsible for the epidemic development of both diseases during the summer months. A similar but less serious type of black end is produced by *Nigrospora sphaerica* [loc. cit.] during the winter and spring months, and a still less important one by *Fusarium* spp. [loc. cit.] in fruit roughly handled or over-ripe at the time of packing.

Infection by *G. musarum* takes place while the fruit is still on the plant, the spores from the acervuli on dead leaf bases being transmitted by rain. In the laboratory, spores dried singly survived for only a short time, but when allowed to remain in a mass in the acervulus some of them would germinate after about 8½ months. The optimum temperature for the growth of *G. musarum* varied from 28° to 30°, falling with the progressive age of the culture; growth ceased at about 37° and was very scanty below 15°. Spore formation was abundant within the range from 25° to 34·5°, diminishing with lower temperatures and finally ceasing at 15°. Spore germination took place satisfactorily between 19° and 36°, but was best at the range of temperatures optimal for growth. It is suggested that high temperatures should be avoided for ripening, and that in warm summers harvested fruit should be

transported to the ripening rooms as quickly as possible and kept as cool as practicable during transport. Infection in the field depends largely on conditions of high temperature and humidity which prevail in Queensland during January and February. More severely affected fruit occurred on badly kept plantations. Incidence of infection was found to be correlated with the number of dead leaves left on the plant. The presence of waste fruit and bunch stalks inside or near the packing shed is likely to result in some additional infection during packing. The slightly smaller, normal summer fruit, which matures during December, January, and February, particularly that with long stalks, is somewhat more susceptible to the fungus than the larger type maturing in March. Fruit of the so-called 'mixed ripe' stage showed 43·2 and 79·7 per cent. severe black end and anthracnose, respectively, as compared with 5·1 and 13·9 per cent. in the normal full [not so ripe] fruit. Fruit should not, therefore, be picked too late. There was little varietal difference in susceptibility in the wounded fruit of Veimama and Cavendish bananas, but the uninjured skin of the former variety was slightly more resistant.

Infection during packing and transport can be avoided by careful handling and by packing in small clusters of four or six to avoid bending or splitting of the fruit stalk. Observations in the ripening rooms showed that fruit ripened quickly escaped practically all black end except that initiated by injury or an over-ripe condition.

None of the fungicides used in spraying and fumigation trials gave satisfactory control. Immersion in various strengths of Shirlan AG resulted in only a moderate reduction of black end of the *G. musarum* type, but gave good control of *N. sphaerica*. It is considered that commercial control of black end can only be achieved by observing plantation hygiene and maintaining the conditions outlined above during transport and ripening. Investigations into the method of infection by *G. musarum* indicated that the appressoria of the fungus may be more resistant to chemicals than the spores; a form of latent infection was demonstrated which may also possibly play a part in the failure of fungicidal treatments.

CRANDALL (B. S.). **Known range of Persimmon wilt in 1939.**—*Plant Dis. Reptr*, xxiv, 9, pp. 168–169, 1 map, 1940. [Mimeographed.]

In addition to States already reported to harbour the *Cephalosporium* wilt of persimmon (*Diospyros virginiana*) [*R.A.M.*, xviii, p. 537], recent (1939) surveys for the disease revealed its presence in Texas. The disease is characterized internally by fine, brownish-black streaks in the wood, and externally by a sudden foliar wilting, beginning with the upper branches and eventually spreading over the entire tree. The small chlorotic leaves occasionally borne in the spring by trees infected during the previous year gradually droop and fall in the early summer. Diseased trees usually die by the late summer, when masses of the salmon-pink spores of the causal organism are produced between the bark and the wood. Typical spore production also takes place in cultures of the fungus on artificial media in a week or ten days. *D. lotus* and *D. kaki*, both of Asiatic origin, have been found highly resistant to the wilt disease.

MANNS (J. F.). **Modern spraying and dusting outfits.**—*Trans. Peninsula hort. Soc.*, xxix (*1939*), 5, pp. 42–45, 4 figs., [? 1940].

A note is given describing a new mechanical spraying apparatus named 'speed sprayer', invented by G. W. Daugherty and marketed by the Superior Spray Machine Company, Orlando, Florida, in which the spray material is broken into a mist and directed on to the plants to be sprayed by a propeller, like that of an aeroplane, with adjustable blades. It is claimed that this machine forces the spray through trees with thick, heavy foliage and enables 50 to 75 acres of orchard to be sprayed per day. Some details are also given of the experimental use of the aeroplane in dusting and spraying.

PASINETTI (L.). **Contributo allo studio dei composti fenolmercurici e tiofenoli come veleni protoplasmici nella lotta anticrittogamica.** [A contribution to the study of phenolmercuric and thiophenol compounds as protoplasmic poisons in fungicidal control.]—*Riv. Pat. veg.*, xxx, 3–4, pp. 137–148, 1940.

In laboratory tests with six products, in which the two chief components consisted of a phenol derivative (e.g., parachlorophenol) and a mercury or sulphur derivative, evidence was obtained that it is possible to increase appreciably the fungicidal toxicity of certain organic compounds by associating them with organic or inorganic mercury salts or sulphur. The data also supports the hypothesis that the stimulating effect of mercury on plant growth is a physico-chemical action of a transitory nature.

DARKER (G. D.). **A brief host index of some plant pathogens and virus diseases in Eastern Asia.**—*Plant Dis. Reptr, Suppl.* 122, pp. 93–123, 1940. [Mimeographed.]

This abridged index, arranged under the host names in alphabetical order, of bacterial, fungal, miscellaneous, and virus diseases of plants in Eastern Asia has been compiled from Merrill and Walker's 'A Bibliography of Eastern Asiatic Botany', Arnold Arboretum of Harvard University, 1938.

BAKER (R. E. D.). **Distribution of fungous diseases of crop plants in the Caribbean region.**—*Trop. Agriculture, Trin.*, xvii, 5, pp. 90–94, 1940.

A list, based on replies to a detailed questionnaire and intended to be of use mainly for plant quarantine purposes, is given of the chief fungal and bacterial diseases of exclusively tropical crops in the Greater and Lesser Antilles. The entries are arranged under hosts. No doubtful records are included, the localities in which each disease definitely is or is not present being clearly shown.

GARDNER (H. A.) & HART (L. P.). **Recent mildew tests in Florida.**—*Circ. Amer. Paint Varn. Mfrs' Ass.* 574, pp. 28–32, 1939. [Abs. in *Build. Sci. Abstr.*, N.S., xiii, 5, p. 70, 1940.]

In continuation of previous experiments, white lead, leaded zinc, zinc sulphide, magnesium and lead, zinc, and titanium white paints and commercial red and green paints containing a number of different

fungicidal constituents have been subjected to severe conditions of exposure in Florida [*R.A.M.*, xvii, p. 830]. The results of the tests indicated that white lead paints require a very strong disinfectant to prevent mildew, to which those containing zinc oxide, however, are less susceptible. This compound, or others of equivalent toxicity, should be freely incorporated in red and green paints to confer protection from fungal infection.

Report of Proceedings, Third International Congress for Microbiology, New York, 1939.—xi+883 pp., New York, International Association of Microbiologists, 1940. $5.

In this report [cf. *R.A.M.*, xvi, p. 482] it is stated that at the Third Congress of the International Society for Microbiology, held in New York in September, 1939, the following recommendations of the Permanent Committee on Nomenclature were accepted. A recognized bacteriological code shall be developed tentatively, and its publication authorized, in the hope that the question may be finally settled at the next Congress. The Nomenclature Committee shall continue to function as at present constituted, under the auspices of the International Association of Microbiologists. The functions of the International Committee on Bacteriological Nomenclature and its Judicial Commission are defined. When any microbiologist considers desirable a particular interpretation of any rule or recommendation of nomenclature he should submit a brief on the matter to the Chairman of the Judicial Commission; an opinion will then be formulated, which may not be issued until approved by eight members of the Commission.

Among the many papers communicated the following may be mentioned. R. E. Buchanan (p. 156) states that the bacteriological code in question adapts the botanical code to the characteristics of bacteria, with the following modifications: later homonyms of generic protozoological names introduced into bacteriology are invalid; names of genera and subgenera are of equal value, as are those of species and subspecies; all references to the naming of hybrids are eliminated; and botanical are replaced by bacteriological examples.

W. H. Burkholder (p. 163), discussing the relationships of the phytopathogenic bacteria [ibid., xix, p. 203], states that these organisms do not constitute a natural division separated from other members of the Eubacteriales. They may be divided into four or five groups, referable to an already existing genus of Bergey's classification or to a closely related genus. Most of them are closely related to non-sporeformers of the soil. The members of *Erwinia* resemble species of *Aerobacter*. Some 75 species of *Phytomonas* are related to *Pseudomonas fluorescens* and should be combined with *Pseudomonas*. The pathogens causing plant hypertrophies resemble *Bacterium radiobacter* and the members of *Rhizobium* [ibid., xix, p. 461]. The wilt-producing bacteria show certain relationships with *Rhizobium*, but might be placed in another genus. Some 40 closely related species, of which *Phytomonas campestris* is representative, require a new generic name [cf. ibid., xviii, p. 659].

C. Thom (p. 187), dealing with *Aspergillus-Penicillium* relationships, concludes that *Aspergillus* and *Penicillium* become almost inextricably involved when numerous variants are compared. Some of these

variants pass into the *Gymnoascus* type of fruiting so completely that the line dividing families must be arbitrarily drawn rather on general strain morphology than on definite diagnostic characters.

C. Naeslund (p. 189), Miss D. Erikson (p. 192), and V. Puntoni (p. 195) discuss the classification of the Actinomycetes.

Dealing with the taxonomy of the anascosporous yeast-like fungi, N. F. Conant (p. 198) states that in the search for a single generic term for these fungi, *Syringospora* Quinquaud 1868 and *Parendomyces* Queyrat and Laroche 1909 must be given careful consideration, because of priority. *Mycotorula* Will 1916 or *Candida* Berkhout 1923 could be retained only by the establishment of either as a *nomen conservandum*.

Rhoda W. Benham (p. 200) produces evidence to show that *Monilia* [*C.*] *albicans*, *M.* [*C.*] *parapsilosis*, *M.* [*C.*] *krusei*, and *M. mortifera* [ibid., xvi, p. 811] are distinct species. Strains of *C. albicans* varied both in morphology and virulence, and it is suggested that *Mycotoruloidea ovalis*, *Monilia stellatoidea* [see above, p. 534], and possibly *Monilia candida* [*C. vulgaris*] are variants of *C. albicans*.

W. D. Stovall (p. 202) states that the classification of fungi known variously as Castellani fungi, yeast-like fungi, and *Monilia* is much confused, due in part to lack of uniformity in the conditions under which the organisms were cultured. In studies of over 1,000 cultures from various sources, the morphology of the colony, when grown for 24 hours at 37° C. on malt agar, differentiated three species, mainly in radial striations. Fermentation in 1 per cent. maltose and 1 per cent. saccharose beef infusion broth incubated for 48 hours at 37° also indicated three species. Coagulation of calcium lactate milk was accomplished in 24 to 48 hours only by [*C.*] *albicans*, but with longer incubation periods, occasionally a strain of [*C.*] *parapsilosis* produced this reaction. None of the organisms liquefied gelatine. The organisms also showed differences in pathogenicity when given intravenously to rabbits, type I (*C. parapsilosis*) showing no pathogenicity, type II (*C. albicans*) being pathogenic, and type III (*M. candida*) [*C. vulgaris*] feebly pathogenic. Serological studies showed a characteristic difference between type I and the other two species. *C. albicans* and *C. vulgaris* showed no distinguishing antigenic differences.

Joanna Westerdijk and H[armanna] A. Diddens (p. 204) list the methods used at Baarn to prevent the occurrence of variations in the type culture collection. These include the greatest possible frequency of transfer, growing at 12° to 17° in a diffused light, choice of several suitable nutrient media, and their low concentration and changing.

H. E. Prince, Marie B. Morrow, and E. P. Lowe (p. 270) produce evidence indicating that air-borne moulds cannot be disregarded as potential etiological agents in respiratory allergic reactions.

W. M. Stanley (p. 43) discusses the properties of viruses. J. Henderson Smith (p. 277) points out that although some at least of the plant viruses are nucleoproteins with large molecules, the number of viruses shown by detailed analysis to be really proteins is still very small.

F. C. Bawden and N. W. Pirie (p. 279) tabulate the elementary analyses of six virus proteins, tobacco mosaic, cucumber virus 3, potato virus X, potato virus Y, bushy stunt, and tobacco necrosis. The first four have asymmetrical particles: dilute solutions show anisotropy of flow,

while concentrated solutions are liquid crystalline. The first two give needle-shaped paracrystals, the second two amorphous precipitates, when precipitated with acid or salts. The last two give isotropic solutions: they are soluble at their isoelectric points and when precipitated slowly with salts form true crystals. These viruses are doubly crystalline, in the sense that the particles arrange themselves regularly to form visible crystals or liquid crystals, and the units constituting the particles are also arranged with a three-dimensional regularity. The purified viruses differ most markedly from recognized organisms in their chemical simplicity and orderly structure.

K. M. Smith and W. D. MacClement (p. 312) state that the difficulty of recovering viruses by inoculating plants with the juice of viruliferous insects is due to the presence of inhibitors in the insects. In their experiments they found that all plant viruses tested in low concentrations were destroyed after ingestion by the caterpillar *Protoparce sexte*, while the only virus recovered after feeding it in high concentration was that of tobacco mosaic. Caterpillars survived injection with 2 c.c. of a concentrated solution of tobacco mosaic virus, but no evidence has so far been obtained that this enables them to effect transmission. By using the vector of sugar beet curly top virus [*Eutettix tenellus*] to recover this non-sap-transmissible virus from injected caterpillars it was established that injected curly-top virus persisted in the blood of caterpillars.

W. Carter (p. 313) adduces further evidence that the functions of the symbionts of *Peregrinus maidis* are not directly related to those of the virus of maize mosaic.

L. O. Kunkel (p. 315) states that tobacco mosaic virus mutant K20 caused filiforming of the leaves at all seasons and under various growing conditions. Mutant K23 produced a yellow mosaic with an orange shade and ring spot lesions on tobacco leaves, and gave rise to substrain K23–D1, which caused necrosis of tobacco without chlorosis. This substrain moves readily in tobacco plants and is highly infectious; it can very satisfactorily be used in cross-immunization experiments in tobacco.

H. H. McKinney (p. 316) states that in his investigations rapid domination of one virus over another occurred consistently only when the suppressed virus was a direct-line mutant from the dominating virus. With two primary mutants from the same virus domination was either quantitative with regard to time, or erratic. *Nicotiana* virus 6 and a yellow mosaic mutant from *N.* virus 1 induced local necrotic lesions on the leaves of Maryland Medium tobacco and *N. sylvestris*. The number of lesions of *N.* virus 6 per unit area of leaf was reduced, and the appearance of lesions was delayed, as compared with the controls, when the test plants carried *N.* virus 1, a mild green mosaic mutant from *N.* virus 1, potato virus Y, or cucumber mosaic (Doolittle's type), celery mosaic, potato veinbanding mosaic viruses. With the yellow mosaic mutant, *N.* virus 1 consistently afforded complete protection against lesions even in the very young leaves of both hosts. The mild green mutant gave complete protection in *N. sylvestris*, but in Maryland Medium it sometimes gave complete, and sometimes partial protection. In all instances, the cucumber, celery, and potato viruses gave partial pro-

tection. A ring spot virus also reduced the number of lesions produced by the yellow mosaic mutant. Assuming that degrees of protection indicate degrees of relationship all the mosaics studied are related and the ring spot virus is related to the mosaic viruses.

K. SILBERSCHMIDT (p. 320) states that potatoes degenerate very rapidly in Brazil, where old, indigenous varieties do not exist locally. Many wild Solanaceous plants occur as common weeds in the potato field [ibid., xix, p. 234].

A. L. CARRIÓN (p. 506), from eight years' study of fungi isolated from cases of chromoblastomycosis in ten different countries, concludes that they should all be classified as *Phialophora verrucosa* [ibid., xix, p. 406], *Fonsecaea pedrosoi*, or *F. compactum*.

W. A. E. KARUNARATNE (p. 507) states that in Ceylon rhinosporidiosis [*Rhinosporidium seeberi*: ibid., xv, p. 803; xix, p. 218] is widely distributed and is about eight times as common among Moors as among Sinhalese. The direct evidence in favour of trauma as an etiological factor is slight, but there is much indirect evidence in support of it. Further evidence has confirmed the possibility of local epithelial infection by spores, and, in the author's opinion, such local infection may occur in the absence of recognizable trauma.

P. NEGRONI (p. 508) described the cultural characters of *Histoplasma capsulatum* [ibid., xix, p. 472] isolated from the first South American case of histoplasmosis in 1937. The fungus forms small spores 1·9 to 4·6 μ in diameter, and verrucose, globose, or piriform hypnospores measuring 7·5 to 28 μ in diameter.

P. REDAELLI and R. CIFFERI (p. 509), referring to their erection of the monotypic family Histoplasmaceae among the anascosporic yeasts for the genus *Histoplasma* [ibid., xvii, p. 816], state that in addition to the type species, *H. capsulatum*, *H. farcinimosum* and *H. muris* have been added. The life-history of the first two cultivated species is revised, and the absence of a perfect stage confirmed. The parasitic stage is represented by small, yeast-like, budding cells multiplying only in the macrophagic cells of the reticulo-endothelial system in man and laboratory animals. The saprophytic stage comprises two fundamental types, one with a poorly developed mycelium and, rarely, small blastospores, and the other with a well-developed mycelium and clubbed or spherical chlamydospores.

A. HOWELL (p. 509) states that the optimum temperature for the growth and sporulation (on potato maltose agar) of the saprophytic phase of *H. capsulatum* is 25°, and the maximum growth temperature is between 30° and 37°, while the optimum hydrogen-ion concentration of the medium is approximately P_H 6·5 to 7·5. Comparative data are given for *Sepedonium chrysospermum*, *S. xylogenum*, and *Stephanoma tetracoccum* [ibid., xviii, p. 457].

R. V. TALICE and J. E. MACKINNON (p. 510) adduce evidence that *Sporotrichum asteroides* is synonymous with *Rhinocladium schenckii* [*S. schenckii*: ibid., iv, p. 283; xvi, p. 608].

C. W. EMMONS (p. 511) states that the existence of a large number of species of dermatophytes is probably an expression of their mutability, which is capable of demonstration by observation of intergrading forms among strains, by the spontaneous appearance of mutants,

and by stimulation of mutation by ultra-violet radiation [ibid., xix, p. 215].

D. S. MARTIN (p. 516) presents data illustrating the value of serologic methods in the study of certain fungal infections.

In the symposium on host-parasite relationships several papers deal with the comparison of processes in fungal infections of plants and animals. G. H. COONS (p. 523) deals with etiology and pathogenesis in plants, J. C. WALKER (p. 525) with tissue reactions in plants, J. G. HOPKINS (p. 526) and E. C. STAKMAN (p. 527) with resistance and immunity in animals and plants, respectively.

J. N. COUCH (p. 527) states that scale insects are not infected directly by the basidiospores of *Septobasidium curtisii* [ibid., xviii, p. 59], but by smaller bud cells from the spores. Infection generally occurs through the legs or antennae, but sometimes directly, through the body wall. In *S. schweinitzii* the process is similar. In *S. apiculatum* neither the spores nor the bud cells appear to cause infection. The infected insect may remain at home, crawl to another fungal-insect colony, or settle on the clean bark and start a new colony. Haustoria develop only in the haemocoel and do not attack the vital organs of the insect. Parasitized insects outlive healthy ones but are dwarfed, and do not reproduce. Male insects do not become infected.

C. DRECHSLER (p. 528) states that approximately 75 terrestrial fungi are known to destroy the microscopic terricolous animals infesting old agar cultures from decaying plant material. Of these, 40 destroy soil-inhabiting rhizopods, and of the 40, 35 belong to the Zoopagaceae [ibid., xix, p. 472], a family with about twice as many predacious as parasitic members, and with three nematode-destroying forms, of which two are predacious while the third is parasitic. The conidia of the two predacious species are more than 1,000 times as bulky as those of the parasitic species. Attachment of conidia to free-living nematodes is promoted by strong adhesiveness, smallness, and slenderness, whereas the conidia of predacious forms must be large as they must produce extensive, strong mycelia. Of 21 interrelated Hyphomycetes preying on nematodes, all except two (capable of holding only feeble eelworms) produce a conspicuously differentiated predacious apparatus. The predacious Hyphomycetes show no apparent kinship with any parasitic fungus infecting eelworms by germinating spores.

Reviewing investigations in the United States on Dutch elm disease (*Ceratostomella ulmi*) [ibid., xv, p. 327; xix, p. 310], with special reference to host-parasite relationship, C. MAY (p. 520) states that in experimental inoculations the fungus effected invasion only through injuries reaching the cambium or xylem. Successful invasion resulted from inoculation of xylem of roots and stems, and petioles, midribs, and secondary leaf veins. Spores injected under water into spring water-conducting vessels near the base of trunks of large trees in full leaf spread 60 ft. in the sap stream in 1 to 2 hours. Upward and downward movement of spore suspension occurred simultaneously in vessels injected at breast height. The initial rate of upward movement was about 4 in. in $1\frac{1}{4}$ sec., but this was much reduced a few minutes after the pressure deficit was adjusted. Movement in summer-wood vessels was much slower. External symptoms sometimes developed seven days after inoculation. Small,

vigorously growing trees high in nitrogen became severely wilted after inoculation, and 93 per cent. of the stems died in six weeks, while trees low in nitrogen wilted slowly, though 73 per cent. of the stems died in one season. Mycelium was found to be only sparsely present in living elm tissues, and radial growth into new growth sheaths inducing self-reinfection was uncommon. Under natural conditions reinfection with the help of biological agencies is common. Recovery from outward symptoms partly depends on the weak penetrative powers of the fungus, which may live on for years in trees that appear to have recovered.

A. H. R. Buller (p. 534) discusses the occurrence and significance of flexuous hyphae in rust fungi. They are present in six genera of the Melampsoraceae, viz., *Coleosporium*, *Cronartium*, *Melampsora*, *Melampsorella*, *Milesia*, and *Pucciniastrum*, and in five of the Pucciniaceae, viz., *Gymnoconia*, *Gymnosporangium*, *Phragmidium*, *Puccinia*, and *Uromyces*.

F. L. Drayton (p. 537) points out that in the Ciborioideae and certain species of the form-genera *Botrytis* and *Sclerotium* microconidia on verticillate conidiophores function as spermatia in the fertilization of ascogonia, initiating apothecia. Irrespective of the conidial stages possessed by some of these fungi, three intergrading types of structural development are found. The first has a stroma, from which the ascogonium is elevated in a receptive body, on fertilization of which the apothecium is developed (*Ciboria* spp. and the brown rot fungi). The second resembles the first, but the stroma shows small sclerotia functioning as vegetative organs only (*Sclerotinia gladioli* and a new species from narcissus bulbs). The third group has sclerotia only, which function sexually and vegetatively: the ascogonia are not raised in receptive bodies before fertilization (*S. sclerotiorum*, *S. trifoliorum*, &c.).

P. H. Gregory (p. 539) describes a method for facilitating field observations on plant material naturally infected with *Botrytis* and investigating sclerotial germination out of doors. As a rule, *Botrytis* conidia are produced, but the connexion of a *S.* stage was established by single ascospore cultures with two *B.* spp. from *Narcissus* and one from *Anemone coronaria*.

Margaret Newton and T. Johnson (p. 544) state that, in nature, variation in *P. graminis* is largely confined to differences in pathogenic potentialities, though uredospore colour occasionally varies. Under laboratory conditions, crosses of *P. graminis* var. *tritici* with the varieties *secalis*, *avenae*, and *agrostidis* produced hybrid rusts differing from any known variety of *P. graminis*. Crosses between physiologic races of var. *tritici* produced many new races; certain pathogenic characters (infection types) were dominant over others, their distribution in F_2 and subsequent generations suggesting Mendelian inheritance. Other evidence indicated that cytoplasm also influences pathogenicity. In crosses between colour variants, normal uredospore colour resulted from the interaction of two pairs of Mendelian factors. Inbreeding of physiologic races gave abnormal rust characteristics, such as reduced vigour of sporulation, diminished pathogenicity, and loss of ability to produce aecidia, with limitation of ability to develop uredospores and teleutospores on barberry, on which some of the uredospores were uninucleate.

In the section dealing with the effects of micro-organisms and chemical substances on atypical growth in plants A. J. RIKER (p. 546) adduces evidence which leads him to doubt whether there is a significant quantitative relation between growth substances observed on plants affected by crown gall and the causal organism (*Phytomonas* [*Bact.*] *tumefaciens*).

L. J. HAVAS (p. 549) describes the effects of animal hormones and vitamins on the incremental growth of crown gall. I. H. BALDWIN (p. 553) states that attenuation of the cell-stimulating capacity of *Bact. tumefaciens* in tomato plants was effected in single-cell cultures by successive transfers in medium containing 0·2 to 0·3 per cent. glycerine. C. STAPP and E. PFEIL (p. 555) discuss the biochemistry of the crown gall tissue [ibid., xix, p. 201].

C. T. W. HAMMARLUND (p. 559) states that in extensive experiments he has obtained excellent control of barley loose and covered smuts (*Ustilago nuda* and *U. hordei*, respectively) and stripe disease (*Helminthosporium gramineum*), wheat loose smut (*U. tritici*), and oats loose smut (*U. avenae*) without any perceptible seed injury by vacuum treatment. The seed is evacuated for five minutes at 10 mm. mercury, and the disinfecting liquid, equally evacuated, is sucked into the reservoir, so that the seed is completely covered. The pressure is then restored to normal height, and the fungicide reaches and kills the hyphae. If the liquid is poured over the seed before evacuation, evacuation must be continued for at least 30 minutes.

T. E. ROEMER, K. ISENBECK, and HANNA BECKER (p. 563) state that the genotypic composition of four different populations of *Tilletia tritici* [*T. caries*] was considerably changed following 7 to 10 years' passages through four different wheat varieties [cf. ibid., xix, p. 79]. A strongly aggressive population remained unchanged after 10 years' passage, while a weak population became very aggressive after the same number of years. The virulence of populations which passed through resistant varieties during many years was retained when they were subsequently bred on susceptible ones. Passage for many years through susceptible hosts did not ensure the presence of all the original genotypes of *Tilletia* populations.

J. H. SWARTZ (p. 569) gives a detailed clinical description of two cases of extensive lichenified dermatitis caused by *Trichophyton rubrum* [ibid., xviii, p. 678]. The fungus lost its gross cultural characteristics and showed great variation in the production of microscopical characters; macroconidia were produced irregularly on Sabouraud's glucose medium, but abundantly on polished rice in flasks.

AINSWORTH (G. C.). **The identification of certain viruses found infecting leguminous plants in Great Britain.**—*Ann. appl. Biol.*, xxvii, 2, pp. 218–226, 2 pl., 1940.

The following are among the points noted in this survey of virus diseases of leguminous plants in Great Britain. The virus of the English common bean mosaic was found not to differ essentially in its physical properties from bean virus 1 [*R.A.M.*, xiii, p. 488]. Outbreaks of common bean mosaic are stated to originate almost always from infected seed. From 7 to 20 per cent. of the seedlings raised in the glasshouse from infected seed showed symptoms of mosaic. The mosaic is fre-

quently found on the climbing varieties of *Phaseolus vulgaris* grown under glass, but it is not severe on the popular Guernsey Runner.

A disease closely resembling enation pea mosaic [ibid., xviii, p. 287], previously described only from the United States, is stated to occur commonly on sweet pea in south-eastern England; on culinary peas it was found only in one locality in Hertfordshire. The virus produces enations on the under sides of Alderman, Perfection, and The Lincoln peas, Harlington Windsor broad bean (*Vicia faba*), and sweet pea leaves. On the last-named host the first symptom is a prominent yellowing of the veins, followed by a rather characteristic yellow flecking of the leaves, enations, and slight deformation of the pods; the flowers are not broken, but occasionally infection has been associated with a few small rough lesions on the petals.

Viruses of the pea mosaic type were isolated from peas, sweet peas, broad beans, and red clover (*Trifolium pratense*) from numerous localities. One strain, which is widespread on peas and broad beans, and produces a very slight leaf mottle in sweet peas, causing severe flower break in coloured varieties, is stated to agree fairly closely with pea virus 2A [ibid., xvi, p. 583]. Another found naturally only in peas, causing a pronounced yellow mottle and stunting, shows similarities to pea virus 3 [ibid., xvi, p. 791].

Sweet pea streak, found to be invariably associated with virus infection, is thought to be a complex of virus diseases. One form of streak is due to a single virus which causes in sweet pea a well-defined clearing of the veins of the younger leaves, followed by a distinct but not very severe leaf mottle, brown, necrotic streaks on the stem and petioles, and breaking of the flowers. Sometimes the disease becomes more aggressive and kills the seedlings. To this virus (the physical properties of which are similar to those of pea mosaic) The Lincoln, but not Perfection pea, broad bean, French bean, and white clover (*T. repens*) are susceptible. It is suggested that while this virus is not identical with either bean virus 2, white sweet clover [*Melilotus alba*] mosaic virus, or the severe pea mosaic virus [ibid., xiii, p. 488; xvi, pp. 84, 650, respectively], it yet belongs to the same group.

Lettuce mosaic virus [ibid., xviii, p. 649], inoculated into sweet pea, gave rise after two or three weeks to small, brown lesions on the main stem, which may increase in size, and death of the shoot may follow. The new shoots either remain normal or become streaked. No definite leaf symptoms appear, although the virus was found to be present in all parts of the shoots; the flowers were not broken. Sweet pea plants received from one locality in Hertfordshire showed streak symptoms, and the causal virus proved to be of the cucumber virus 1 type, not previously observed on this host in this country. On inoculation into sweet pea seedlings severe streak symptoms developed after about 14 days and the plants died later.

A single sweet pea plant grown under glass was found to be infected with the virus of tomato spotted wilt [ibid., xvi, p. 321], this being a new British record. The diseased plant did not exhibit streak symptoms, but it was stunted and showed yellow spots or broad streaks on the leaves.

In protective inoculation experiments, peas infected with the mild strain of pea mosaic virus were resistant to the yellow strain, but a

plant showing symptoms of enation mosaic was susceptible to either of these strains. In the field, sweet peas were commonly found to be infected with both enation mosaic and common mosaic viruses. Sweet pea plants infected with lettuce mosaic could be infected with any of these viruses or with sweet pea streak virus. Bean mosaic virus did not protect French beans against the sweet pea streak virus, but there was a delay of about seven days in the appearance of symptoms due to the latter virus in pea plants previously inoculated with either the mild or yellow strains of pea mosaic.

WATSON (M[ARION] A.) & ROBERTS (F. M.). **Evidence against the hypothesis that certain plant viruses are transmitted mechanically by aphides.**—*Ann. appl. Biol.*, xxvii, 2, pp. 227–233, 1940.

In further experiments on the mode of transmission of persistent and non-persistent plant viruses by insects [*R.A.M.*, xix, p. 230], starved individuals of *Myzus persicae* after feeding for two minutes on infected plants successfully transmitted *Hyoscyamus* 3, potato Y, and severe etch viruses, all non-persistent in the vector, from tobacco to a number (up to 10) of successive healthy plants. With all three viruses aphids often failed to infect some healthy plants in the middle of a series, but infected later plants. When infective aphids were fed on two successive healthy plants the number of second plants infected decreased with increasing feeding time on the first healthy plant, none being infected after one hour. Infective aphids allowed short feeding periods on a succession of healthy plants gave infections in a series of nine consecutive healthy plants, while others fed continuously on one healthy plant for a corresponding total period failed to infect any of the second plants. These results are held to contradict the opinion that the non-persistent viruses are transferred mechanically through the cleansing of contaminated stylets of the infective aphids when feeding on a healthy plant. The hypothesis is advanced that the mechanism of transmission is not fundamentally different between the persistent and non-persistent viruses, but while the latter are inactivated by a secretion produced by the aphids during feeding, the former are resistant to it. A close specific relationship between the non-persistent viruses and insects with a particular type of physiology is postulated.

SCHOPFER (W. H.) & BLUMER (S.). **Étude comparative de la spécificité d'action de la pyrimidine, constituant de l'aneurine, facteur de croissance de microorganismes.** [A comparative study of the specificity of action of pyrimidin, a constituent of aneurin, a growth factor of micro-organisms.]—*Enzymologia*, viii, 4, pp. 261–264, 1940.

This is a detailed, tabulated account of studies at the Berne Botanical Institute on the specific action of pyrimidin, a constituent of aneurin (vitamin B1), on nine fungi of different groups, including *Polyporus adustus* [*R.A.M.*, xvii, p. 196; xviii, p. 335], *Phytophthora fagopyri* [ibid., xv, p. 102], and *Schizophyllum commune*. Pyrimidin was found to replace aneurin completely as an indispensable growth factor for *Polyporus adustus*, but was only a partial substitute in the case of *Phytophthora fagopyri* and *S. commune*.

Black (L. M.) & Price (W. C.). **The relationship between viruses of Potato calico and Alfalfa mosaic.**—*Phytopathology*, xxx, 5, pp. 444–447, 1 fig., 1940.

A comparative study was carried out at the Rockefeller Institute for Medical Research on the viruses of potato calico [*R.A.M.*, xix, p. 162] and lucerne mosaic [ibid., xv, p. 274], both of which were readily transferred by abrasion from diseased *Nicotiana glutinosa* to healthy plants of the same species after an incubation period of three to four days, as well as to Early Golden Cluster and Corbett Refugee beans (*Phaseolus vulgaris*), Black Eye cowpeas, broad beans (*Vicia faba*), Green Mountain potatoes, crimson, red, and white clovers (*Trifolium incarnatum*, *T. pratense*, and *T. repens*), and Improved Long Green cucumber. The viruses induced necrotic primary lesions on beans and cowpeas, sometimes developing within 24 hours on the former, mottling of white clover, the same accompanied by veinbanding in crimson and red clovers, and a bright yellow spotting of cucumber leaves. The symptoms caused by the potato calico virus were more severe on potato seedlings than those due to lucerne mosaic, whereas the latter was more injurious to *N. glutinosa* and crimson and red clovers. Under comparable conditions the potato calico virus produced fewer lesions in kidney and broad beans and cowpeas than did that of lucerne mosaic. These results were considered to indicate that the potato calico and lucerne mosaic viruses represented distinct strains of a single infective entity.

Cross-inoculation tests were made as follows. Groups of six young *N. glutinosa* plants were inoculated with each of the viruses responsible for lucerne mosaic, potato calico, potato ring spot, cucumber mosaic, and Canada streak [ibid., xix, p. 162], while juice from healthy *N. glutinosa* was rubbed over the leaves of a further six. Twelve days later, when the inoculated plants had contracted systemic infection, three upper leaves of three plants in each group were inoculated with juice from *N. glutinosa* infected by lucerne mosaic, the foliage of the three remaining plants being similarly rubbed with healthy *N. glutinosa* juice. After a fortnight, of the leaves rubbed with juice containing lucerne mosaic those previously inoculated either with this virus or potato calico were alive and green, while the others were dead or nearly so. Furthermore, the new foliage on the plants previously infected by these two viruses showed no symptoms beyond those typical of the chronic stages of the corresponding diseases, whereas systemic necrotic lesions characteristic of the acute phase of lucerne mosaic were shown by the fresh growth on the other plants. None of the control plants treated with healthy juice developed additional symptoms. In a similar experiment with Turkish tobacco, plants previously inoculated with potato calico did not contract necrotic primary lesions on subsequent inoculation with lucerne mosaic, whereas the leaves of healthy plants or those previously infected with cucumber mosaic were severely attacked.

On the basis of this evidence the potato calico virus is classified as a strain of lucerne mosaic to be designated *Marmor medicaginis* H[olmes] var. *solani* n. var., while lucerne mosaic itself should be known as *M. medicaginis* H[olmes] var. *typicum* n. var. [ibid., xix, p. 229].

SCHLUMBERGER (O.). **Kartoffelsortenprüfung auf Schorfwiderstandsfähigkeit 1939.** [Potato variety testing for scab resistance 1939.]—*Mitt. Landw., Berl.*, lv, 1, pp. 9–11, 1940.

Some of the recent outstanding contributions [all of which have been noticed in this *Review*] to the knowledge of potato scab [*Actinomyces scabies*] are briefly summarized in connexion with an account of the annual varietal reaction trials under the joint auspices of the Biological Institute and the Reich Food Board [*R.A.M.*, xvii, p. 483]. Of the varieties tested for the third year in succession, Carnea (v. Kameke) and Akebia (v. Kameke 46/902) [ibid., xix, p. 112] gave the best results, the former being to all intents and purposes immune and the latter semi-resistant. V. Kameke's 15/23 was the best of the second-year varieties, while of those entered for the first time the most promising were Knehden 2106 and 874, Lochow 31/201, Pfetten 39/39, and Nordost 38/31/6.

Excellent results in the control of the disease on the Sieglinde, Kaiserkrone, Prisca, and Sickingen varieties was obtained by soil disinfection with P_2 (I. G. Farben), used at the rate of 20 parts to 80 of superphosphate, the percentage (by weight) of healthy tubers ranging from 69·8 to 92·8 in the treated plots compared with 0 to 28·4 in the untreated [ibid., xviii, p. 545].

JEHLE (R. A.). **Disease resistant Potato varieties in Maryland.**—*Trans. Peninsula hort. Soc.*, xxix (*1939*), 5, pp. 20–26, [? 1940].

In seven years' tests carried out in Maryland in which the resistance to diseases of new potato varieties was tested against that of old standard varieties, no mild mosaic [crinkle] developed on Chippewa, Earlaine, Katahdin, Sebago, or Warba potatoes. Sequoia, reputed to be resistant to crinkle, developed less late blight [*Phytophthora infestans*] than the standard varieties, while Warba showed more leaf roll, late blight, and scab [*Actinomyces scabies*] than they did.

Wart-resistant varieties of Potato.—202 pp., 9 figs., Moscow, Selkhozgiz, 1938. Roub. 8. 40. [Abs. in *Plant Breed Abstr.*, x, 3, p. 254, 1940.]

In this manual, edited by S. M. Bukasoff and N. A. Naoumoff, the history and biology of *Synchytrium endobioticum*, the agent of wart disease of potatoes, are described, and the development of varieties resistant to the fungus traced from the first observations of Daine in 1908 to the present time.

Among the wild South American potatoes the following have shown resistance: *Solanum jamesii*, *S. commersonii*, *S. antipoviczii* var. *martinezii*, *S. ajuscoense*, *S. aracc papa* f. *brachikalukon*, *S. cathartum*, *S. edinense*, *S. molinae*, and *S. leptostigma*. Some forms of *S. demissum* have proved resistant, while others are susceptible, and the reaction of *S. palustre* is doubtful. Primitive cultivated species exhibiting resistance to wart disease include *S. stenotomum* var. *phiniu* f. *parvioculosum*, *S. ajanhuiri* formae *coloratum* and *viride*, *S. tenuifilamentum*, and *S. mamilliferum* f. *violacirubrum*. *S. andigenum* and the Chilean samples of *S. tuberosum* were also found to comprise a number of resistant forms.

Resistance was further observed in the following crosses: *S. demissum* with *S. andigenum* var. *quechuanum* and the commercial variety Znicz;

S. acaule×*S. rybinii*; triple hybrids obtained by crossing *S. goniocalyx*×*S. bukasovii* with other species, e.g., *S. rybinii*, *S. phureja*, and *S. ajanhuiri*, and with Wohltmann; the susceptible *S. curtilobum*×the susceptible Deodara, Świteź, and Centifolia and certain resistant varieties; *S. andigenum* var. *colombianum* f. *tocanum*×Epicure, Centifolia, and Jubel; f. *caiceda*×Centifolia; var. *quechuanum*×Centifolia and Weisse Riesen; f. *pacus*×Epicure, Gisevius, Weisse Riesen, and Świteź; var. *cuzcoense*×Centifolia; var. *herrerae*×Centifolia and Jubel; f. *ccompis*×*Centifolia*; and vars. *bolivianum* and *longibaccatum*×Centifolia and Cobbler, respectively.

A comprehensive, annotated list is given of existing wart-resistant varieties and data are presented on the yields of a number of those tested in different parts of the U.S.S.R.

The main characteristics of the South American species, including their reactions to *Synchytrium endobioticum*, are tabulated in a supplement to the monograph, which closes with a fairly complete bibliography.

Marchionatto (J. B.). **La 'Rhizoctonia solani' y la 'R. crocorum' en la República Argentina.** [*Rhizoctonia solani* and *R. crocorum* in the Argentine Republic.]—Reprinted from *J. agron., B. Aires, 1939*, 17 pp., 4 pl. (2 col.), 7 figs., 1940.

During 1937 the presence of *Helicobasidium purpureum* was detected for the first time in the Argentine on potatoes, where the crop is already known to be parasitized by *Corticium vagum* (*Rhizoctonia* [*C.*] *solani*) [*R.A.M.*, xv, p. 249]. The latter generally assumes the form of 'russet scab', 'jelly-end rot' and 'canker' being less frequent under local conditions. The following varieties were attacked by the fungus (in descending order of susceptibility): Alma, Brigitta, Up-to-Date, Majestic, Green Mountain, Rotweissragis, Early Rose, King Edward, Katahdin, and Chippewa. The perfect stage of the fungus has not yet been observed in the country.

The Katahdin tubers infected by *H. purpureum* [ibid., ix, p. 554; xiv, p. 730; xvii, p. 796] bore the characteristic mycelium and sclerotia [which are described]. The perfect stage has been found on lucerne in the Argentine but not on potatoes. Attempts to isolate the fungus were unsuccessful.

Samuel (G.). **Lightning injury to Potato tubers.**—*Ann. appl. Biol.*, xxvii, 2, pp. 196–198, 1 pl., 1940.

A field of Majestic potatoes in Holbeach Marsh, Lincolnshire, was struck by lightning in the summer of 1938. The tops of plants in the affected area showed a flattening and splitting of haulms and below ground the tubers were variously affected, showing deep or superficial burns. In some cases the whole of the central tissue was killed.

Rippel (A.). **Über die Verbreitung von Aspergillus niger, insbesondere in Deutschland.** [On the distribution of *Aspergillus niger*, especially in Germany.]—*Arch. Mikrobiol.*, xi, 1, pp. 1–32, 1940.

The addition of a high concentration (20 per cent.) of tannin to a synthetic nutrient medium was found in the writer's studies at Göttingen

University to facilitate the selective culture of *Aspergillus niger*, whereby the relative prevalence of the fungus in soils of different types and localities can be determined with a fair degree of accuracy.

The incidence of the organism was shown to increase from the north to the south of Germany, being more abundant, moreover, on southern than on northern slopes in a given area. It is also widespread in more southerly regions (Hungary), and in Tanganyika Territory, South-West Africa, South Africa, and Central America, though not absent from northern countries, e.g., Norway and Denmark. In Germany the distribution of *A. niger* roughly corresponds to that of the Mediterranean-Pontic forms among higher plants. Temperature, however, is not the only factor (though a decisive one) in the development of the fungus, which is also strongly influenced by the competitive activity of other soil organisms, notably the Mucorineae, these in turn being favoured by high acidity, low temperature, a plentiful moisture content, and so forth. The abundant occurrence of *A. niger* in dry lawns, meadows, vineyards, and pastures, as compared with forest and raw humus soils, is probably attributable to the scarcity of Mucorineae in the former.

About one-third of the numerous isolations under investigation (including some of the Norwegian strains) formed sclerotia on beer wort agar slants at 30° C. Strains from tropical soils, which at 30° produced a mycelium studded with sclerotia and totally devoid of spores, at 20° gave rise exclusively to spores, sclerotia being entirely absent. Sclerotia also failed to develop in cultures of indigenous strains at 20°.

NIETHAMMER (ANNELIESE). **Verhalten mikroskopischer Bodenpilze gegenüber in der Natur verbreiteten Wuchsstoffen.** [The reaction of microscopic soil fungi to widely distributed natural growth substances.]—*Arch. Mikrobiol.*, xi, 1, pp. 73–79, 1940.

A number of the soil fungi (including *Penicillium bicolor*, *Trichoderma koningi* [*T. viride*], and *Rhizopus nigricans*) previously isolated by the author from fruits and seeds at the German Technical College, Prague, Czechoslovakia [*R.A.M.*, xvii, p. 624] made poor growth in purified sugar solutions but throve on the addition to the nutrient medium of fragments of seed or fruit, organic acids (in tests with *P. expansum*, *Botrytis cinerea*, and *T. viride*), or rare elements (manganese, cobalt, and boron) contained in these organs (*P. expansum* and *T. viride*). Full details of the experiments are given.

GÄUMANN (E.). **Über die Wirtswahl des Uromyces graminis (Niessl) Dietel.** [On specialization in *Uromyces graminis* (Niessl) Dietel.] —*Ber. dtsch. bot. Ges.*, lviii, 2, pp. 92–96, 1940.

Cross-inoculation experiments with overwintered teleutospores of *Uromyces graminis* [*R.A.M.*, xvii, p. 485] on *Melica ciliata* from Valais, Switzerland, on a large number of hosts revealed the existence of three physiologic races of the fungus, including f. sp. *mediterranea* Oliveira, with aecidia and pycnidia on *Coriandrum sativum*, *Foeniculum vulgare*, parsley, and various other plants.

ZUNDEL (G. L.), STEVENSON (J. A.), TUCKER (C. M.), WELCH (D. S.), & WEST (E.). **A note on the status of the generic name Urocystis.**—*Phytopathology*, xxx, 5, pp. 453–454, 1940.

Endorsing the decision of the Nomenclature and Plant Pathological Committees of the British Mycological Society [*R.A.M.*, xviii, p. 755], the American Committee on Fungus Nomenclature recommends the retention of the generic name *Urocystis* in preference to *Tuburcinia* pending a definite ruling by an International Botanical Congress.

ANDERSON (J. P.). **Notes on Alaskan rust fungi.**—*Bull. Torrey bot. Cl.*, lxvii, 5, pp. 413–416, 1940.

In this annotated list of 50 Alaskan rusts are included (in addition to species already mentioned from another source) *Uredinopsis struthiopteridis* [*R.A.M.*, xviii, p. 551] on *Athyrium cyclosorum*, *Phragmidium rubi-idaei* on *Rubus subarcticus* (Greene) Rydb. (*R. strigosus* Mich. in part) [ibid., xiii, p. 526], and *Puccinia coronata* on *Calamagrostis canadensis* [ibid., xvii, p. 737].

HOERNER (G. R.). **The species of the genus Pseudoperonospora and their recorded hosts.**—*Plant Dis. Reptr*, xxiv, 9, p. 170–173, 1940. [Mimeographed.]

Following up his recent studies on the nomenclatorial position of *Pseudoperonospora* [*R.A.M.*, xix, p. 435], the author lists the eight generally recognized species of the genus with their hosts, and appends a bibliography of the more important contributions (comprising 32 titles) to the subject.

VALLEAU (W. D.). **Sweet Clover, a probable host of Tobacco streak virus.**—*Phytopathology*, xxx, 5, pp. 438–440, 1940.

The occurrence of outbreaks of tobacco streak [*R.A.M.*, xix, p. 497] in the Burley variety growing in proximity to sweet clover (*Melilotus alba*), which is itself the host of a virus producing chlorosis and sometimes chlorotic or necrotic ring-and-line patterns, suggested the probable transmission of the disease from *M. alba* to tobacco. In 1937, 1938, and 1939 the percentages of streak in three small plots adjacent to second-year sweet clover at the Kentucky Agricultural Experiment Station were 16·6, 21·3, and 22, respectively, compared with only 0·12 among 13,650 plants in the remainder of the rotation series in 1939. Infection in tobacco coincides with the formation of the sweet clover seeds, at which juncture the hardening of the plants no doubt compels the insect vector to seek other hosts. Extensive plantings of sweet clover do not appear to constitute such a menace to adjacent tobacco crops as scattered roadside weeds, at any rate when left undisturbed by cutting or pasturing, the inference being that under these conditions the vector does not travel long distances.

WEST (J.). **The control of leaf curl of Tobacco in southern Nigeria.**—*Pap. Third W. Afr. agric. Conf., 1938* (Nigeria Sect.), i, pp. 205–206, [? 1940].

Practical control of tobacco leaf curl in southern Nigeria [*R.A.M.*, xvi, p. 131] may be effected in seasons of normal rainfall distribution by

late planting [see next abstract] to coincide with the gradual decline in the white fly (Aleyrodidae) [*Bemisia* sp.] vector population from the end of July onwards, supplemented by subsidiary sanitary measures, such as the destruction of all crop remains at the end of each season, of all 'volunteer' plants before the planting of the new crop, and of any plants developing leaf curl symptoms shortly after transplanting. In the establishment of nurseries it is wise to sow on three separate dates in order that a plentiful supply of vigorous seedlings may be available throughout the transplanting period of August and early September.

SHEPHERD (E. F. S). **Tobacco leaf curl.**—*Pap. Third W. Afr. agric. Conf., 1938* (Gold Coast Sect.), i, pp. 87–89, [? 1940].

Following a brief note on the symptoms of tobacco leaf curl [see preceding and next abstracts] and other abnormalities associated with the development of enations on the veins, the writer states that in the Gold Coast characteristics of the first-named disease are shown by *Acanthospermum hispidum*, *Malvastrum tricuspidatum*, and *Sida carpinifolia*. It will certainly be necessary to insist on the eradication of all mature tobacco plants from the vicinity of a plot to be planted with a new crop, while the removal of all wild hosts of the virus from the neighbourhood of tobacco seed-beds and plots should also assist in control. Seed of the Sterling variety, reported by H. H. Storey to show some resistance to leaf curl at the Amani Research Station, is being introduced into the Gold Coast for trial.

DEIGHTON (F. C.). **Tobacco leaf curl in Sierra Leone.**—*Pap. Third W. Afr. agric. Conf., 1938* (Sierra Leone Sect.), i, pp. 7–8, [? 1940].

Leaf curl of tobacco [see preceding abstracts] appears to be widespread in Sierra Leone, where alternate hosts of the virus include *Sida carpinifolia*, *S. cordifolia*, *S. veronicaefolia*, *Stachytarpheta jamaicensis*, *Ageratum conyzoides*, *Acanthospermum hispidum*, *Synedrella nodiflora*, and *Scoparia dulcis*, while similar symptoms have also been observed at Njala on *Hibiscus esculentus* and the Malayan varieties of *Sesamum indicum*. Tobacco being of relatively slight importance in the colony at the moment, the problem of control does not immediately arise, but in the event of an extension of cultivation the encirclement of the crop by a planting of the densely growing *Digitaria exilis* to exclude the weed hosts of the virus might be considered.

HOPKINS (J. C. F.). **The Tobacco 'kromnek' virus in Rhodesia.**—*Rhod. agric. J.*, xxxvii, 6, pp. 326–329, 2 pl., 1940.

Attention is drawn to the recent detection, in the Bulawayo and Salisbury districts of Southern Rhodesia, of 'kromnek' [spotted wilt] symptoms on *Dahlia*, nasturtium [*Tropaeolum majus*: *R.A.M.*, xvii, p. 141], and tomato, necessitating the adoption of appropriate legislative measures to combat this menace to the tobacco crop [see below, p. 576]. On *Dahlia* the symptoms consist of diamond, concentric ring, and wavy line patterns, yellowish at first, later turning brown or white, on the leaves; sometimes the lines follow the outlines of the veins and produce a 'fernleaf' appearance. On nasturtium also the pale green, yellowish, or whitish areas follow the veins, or dark and pale green

mottling may develop. Under local conditions the most likely method of spread is by means of tubers, bulbs, cuttings, and seedlings; the spotted wilt virus not being transmissible through the seed, new *Dahlia* plantings should preferably be raised from seed rather than by vegetative propagation.

GREEVES-CARPENTER (C. F.). **A blight resistant Chestnut.**—*Sci. Amer.*, clxi, 2, p. 93, 1 fig., 1939.

One of the crosses made between the American chestnut and *Castanea mollissima* introduced from China by the Department of Agriculture in the hope of checking the ravages of blight [*Endothia parasitica*: *R.A.M.*, xix, p. 442] is stated to have grown for 20 years at the Bartlett Tree Research Laboratories and to have fruited for several, the nut being similar to that of the American parent in size, quality, and sweetness. Over 1,000 one-year-old seedlings of this successful cross have been distributed to commercial growers in different parts of the country. The probability of a rehabilitation of the native chestnut in the areas of original invasion of the blight is considered to be remote.

WHETZEL (H. H.). **Sclerotinia bifrons.**—*Mycologia*, xxxii, 1, pp. 124–127, 1940.

A Latin diagnosis is given of *Sclerotinia bifrons* n. sp., the perfect stage of *Sclerotium bifrons* Ell. & Ev., a frequently serious foliar pathogen of aspen [see next abstract], which is stated to have been prevalent in the Ithaca district of New York nearly every spring since 1921, arising from sclerotia fallen to the ground from infected leaves. The apothecia, occurring singly, or occasionally in twos or threes, are broadly infundibuliform to patelliform, 2 to 10 mm. in diameter, 'Saccardo umber' or dark cinnamon, Natal brown at maturity, with thick stipes, 5 to 25 mm. in length; the asci, 152 to 200 by 9 to 12 μ, contain eight obliquely uniseriate, unicellular, broadly ovoid, hyaline, biguttulate ascospores, 11 to 16 by 4 to 7 μ. The fungus described as *Sclerotinia bifrons* by Seaver and Shope from Colorado (*Mycologia*, xxii, pp. 1–8, 1930) has been critically studied by the author and found to be quite distinct from the foregoing and the name *S. confundens* n.sp. is accordingly proposed for it.

[In an editorial note appended to this paper, F. J. Seaver maintains that the name *S. bifrons* Whetzel, representing a later homonym of *S. bifrons* Seaver & Shope, infringes Article 61 of the International Rules of Botanical Nomenclature: he therefore proposes its replacement by *S. whetzelii* Seaver.]

POMERLEAU (R.). **Studies on the ink-spot disease of Poplar.**—*Canad. J. Res.*, Sect. C, xviii, 5, pp. 199–214, 1 pl., 1 fig., 1 diag., 1 graph, 1940.

The ink spot disease of aspen caused by the fungus, *Sclerotinia bifrons* Whetzel [*S. whetzelii* Seaver, see preceding abstract], is stated to be distributed throughout the whole temperate region of the North American continent, attacking chiefly *Populus tremuloides*, but also occasionally *P. nigra*, *P. grandidentata*, and *P. canadensis*. Generally the disease is not very injurious to the trees, but under favourable conditions serious outbreaks may occur. The severe attack lasting from 1935 to 1937, during which the present studies were conducted, caused intense defoliation

and in many cases death of young trees. The sclerotia of the fungus overwinter on the ground; the apothecia are formed fairly early in the spring and, as they become mature, the spores are discharged violently into the air and disseminated by the wind. Attempts to obtain fructifications artificially from sclerotia collected before the winter failed, whereas those allowed to overwinter under the snow fruited abundantly when exposed to a temperature slightly above freezing point, indicating the importance of low temperatures for the formation of fruit bodies. It appears that in nature excessive moisture is necessary to bring about the ejection of ascospores. The spores germinated readily in water, but the development of mycelium was scarce on a medium other than poplar leaves. Infection is easily obtained artificially in the laboratory. In nature, the first symptoms of the disease, appearing about a month after the opening of the buds, consist in more or less extensive, circular or irregular spots, clearly demarcated by a reddish or dark brown discoloration, which may very rapidly cover the entire leaf. The growth of the mycelium in the leaf tissue is generally very rapid; it is inhibited by rising temperatures. The sclerotia arise on small, circular, translucent spots, which usually appear after a few days of rain; after their appearance the remaining portion of the leaf becomes slightly distorted. The sclerotia mature rapidly, in from 15 days to a month, provided abundant moisture is present, and fall to the ground. The disease is especially severe in dense stands of young trees with the foliage not too far from the ground. Generally only young trees are killed even in severe outbreaks, the older ones surviving infection. For an epiphytotic development of the disease the following conditions are essential: the presence of fairly large numbers of sclerotia on the ground, the occurrence of dense stands of young trees, and the prevalence of low temperatures and high degrees of moisture during foliation. Since these conditions rarely coincide and under normal conditions the effects of the fungus are rather mild, the disease is not considered to be of great importance.

CAROSELLI (N.) & HOWARD (F. L.). **Bleeding canker of Maples.**—*Bull. Bartlett Tree Res. Lab.* 3, pp. 44–48, 3 figs., 1939. [Received July, 1940.]

Ornamental maples (*Acer saccharum*, *A. nigrum*, *A. saccharinum*, *A. rubrum*, *A. pseudoplatanus*, and *A. platanoides*) in Rhode Island and the neighbouring areas of eastern Massachusetts are stated to have sustained severe damage of recent years from bleeding canker (*Phytophthora cactorum*) [*R.A.M.*, xvii, p. 713], the first record of which in the locality dates from 1930.

The bark of the trunk and scaffold branches of affected trees bear indefinite cankers, tending to develop vertically rather than laterally, and imparting a furrowed appearance to the smooth cortex of young maples. An exudate resembling dried blood issues from cracks in the cankered bark. Infection progresses most actively in undisturbed trees in moist situations; the rate of advance of the pathogen is accelerated by increased sap flow, so that any factors contributing to succulent growth should be eliminated. The upward movement of the cankers suggests that the primary seat of infection is in the roots.

Chronic and acute secondary symptoms can be differentiated. The former consist of a reduction in the size and number of the leaves and their yellowish-green coloration, accompanied by a progressive die-back of the branches, on older, slowly growing trees; Norway maples generally suffer chiefly from top die-back, while scanty foliage is more characteristic of the sycamore type. Abnormally copious fruit production is another symptom of chronic infection, which may extend over a period of several years before killing the trees. In acute cases, the trees succumb after one to three years. The symptoms are characterized by death of the cambium, giving a furrowed appearance to the trunk, the interior of which (in 15-year-old Norway maples) was found on cross-sectioning to contain reddish-brown necrotic areas, with well-marked, olive-green margins, the latter penetrating deeply into the wood. The discolorations were traced down to the roots, the exterior of which was normal, and their vertical course through the sapwood to the branches was interrupted by irregular lysigenous cavities, sometimes emitting forceful spurts of a reddish-brown, watery fluid in response to blows on the bark.

In greenhouse inoculation tests isolates of *P. cactorum* from maple were pathogenic to tomato, potato, pepper [*Capsicum annum*], eggplant, apple, and pear.

DEMAREE (J. B.), COLE (J. R.), PARSON (H. E.), & LARGE (J. R.). **Diseases of the Pecan.** *ex* **Insects and diseases of the Pecan and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1829, pp. 36–70, 21 figs., 1940.

This bulletin (superseding No. 1672 of the same series [*R.A.M.*, xi, p. 213]) presents in a popular form the available knowledge concerning pecan diseases and their control in the United States, where the importance of scab (*Cladosporium effusum*) is stated to be increasing year by year, the wide dissemination of the different physiologic races of the fungus involving a large number of varieties. In some localities in the southern range of distribution of the tree, downy spot (*Mycosphaerella* (*Cercosporella*) *carygena*) [loc. cit.], vein spot (*Gnomonia nerviseda* Cole), leaf blotch (*M. dendroides*), brown leaf spot (*Cercospora fusca*), and liver spot (*G. caryae* Wolf var. *pecanae* Cole) cause serious damage to the foliage. Generally speaking, notwithstanding the introduction of progressive methods in orchard planting, the earlier known pecan diseases, with the possible exception of rosette [ibid., xvi, p. 717], are more severe than formerly, contributory factors in the enhanced pathogenicity of the causal organisms, besides their wider extension, being the debility of the trees from crowding and neglect in earlier years.

The resemblance of vein spot to scab lesions on the leaves is so close that the two diseases are readily confused, the spots produced by both pathogens originating in the veins and turning dark brown to black in the final stages. *G. nerviseda* forms two kinds of lesions, those developing on the very small veins being circular or oval and seldom exceeding $\frac{1}{4}$ in. in diameter, while the larger veins and petioles bear long, narrow discolorations, sometimes extending from the base to the apex of a leaflet. The leaf tissues on either side of the veins are not extensively

invaded. Severe attacks on the petioles may either cause wholesale premature defoliation or girdling of the petioles, in which case the dead leaflets adhere to the tree for a time. The Van Deman, Frotscher, and Stuart varieties are particularly subject to infection by *G. nerviseda*, the life-history of which is similar to that of most other fungal parasites of pecan foliage, overwintering taking place on the fallen leaves, with spore formation in the early spring and inoculation of the new leaves in April. Good commercial control of vein spot can usually be obtained by one pre-pollination treatment with Bordeaux mixture 4–1–100 and one or two subsequent applications of the same preparation at 6–2–100, the first shortly after pollination and the second three weeks later. Scab may be similarly combated [ibid., xvi, p. 426], with the addition of a fourth spray (Bordeaux 6–2–100) three weeks after the foregoing.

The first symptoms of liver spot appear in May and June as dark brown, circular spots $\frac{1}{8}$ to $\frac{3}{8}$ in. in diameter, on the lower surface of the leaflets, mainly along each side of the midrib. In September and October the colour of the lesions changes to cinnamon-brown and the dark fructifications of the fungus develop in the centre. Extensive premature defoliation may occur at this time in severe cases of infection by *G. caryae* var. *pecanae*, good control of which is given by one application, preferably after the middle of May, of 6–2–100 Bordeaux mixture.

G. dispora Demaree & Cole, the agent of long, narrow, nearly black, necrotic areas, $\frac{1}{2}$ in. or more in diameter, between the lateral veinlets, has so far been found only on rosetted trees, suggesting that the fungus is a weak parasite.

Chambers (E. L.) & Kouba (T. F.). **White Pine blister rust in Wisconsin.**—*Bull. Wis. Dep. Agric.* 204, pp. 37–48, 6 figs., 1939.

A brief, popular account is given of white pine [*Pinus strobus*] blister rust [*Cronartium ribicola*: *R.A.M.*, xix, p. 314] and its control in Wisconsin, where in January, 1939, infection was observed on pine or *Ribes* in 69 counties, virtually covering the entire State.

Lyon (E. D.). **Machine shave, sterilize, sapwood to stop Cedar pole sap rot.**—*Elect. World, N.Y.*, News Issue, cxii, 6, pp. 43–44, 103, 3 figs., 1939.

Although modern creosote treatments, giving $\frac{1}{2}$ in. penetration, have preserved western red cedar [*Thuja plicata*] butts for a service life of 35 years, sapwood rot [unspecified], largely concealed by an outer shell of sound wood, frequently cuts the duration of the above-ground portions of telegraph poles far below this figure. Out of 535 poles treated with linseed oil paint, 48·4 per cent. showed some degree of sapwood decay above soil-level, their average life being 13 years. Poles with thick sapwood having proved most susceptible to rotting, the Commonwealth Edison Company has adopted the practice of shaving it down to less than $\frac{1}{2}$ in., followed by 15 minutes' immersion in creosote at 170° to 180° F. An electrically driven high-speed shaver is used, the average time for the treatment of a 35-ft. to 60-ft. pole being about six minutes.

FINDLAY (W. P. K.). **Douglas Fir and Baltic Redwood. The conclusions drawn from tests on their resistance to decay.**—*Timb. Tr. J.*, clii, 3311, pp. 323–324, 1940.

Small test pieces of the heartwood of Douglas fir (*Pseudotsuga taxifolia*) from six localities in Canada and of Baltic redwood (*Pinus sylvestris*) from six localities in Sweden, Poland, Finland, and the U.S.S.R. were sterilized by heating, weighed under aseptic conditions, and placed on pure cultures of *Merulius lacrymans*, *Coniophora cerebella* [*C. puteana*], *Poria vaillantii*, *Lentinus lepideus*, and *P. xantha* [ibid., xviii, pp. 76, 362] in special culture flasks, kept at 22° C., water being added to maintain optimum humidity. Twenty test pieces from each of the two lots were exposed to each fungus, and the losses of weight due to fungal attack after four months were averaged.

The [tabulated] results showed that in the Canadian material the average percentage losses in dry weight due to the fungi were, respectively, 6·8, 4·9, 4·0, 4·1, and 10·3 (grand average 6), the corresponding figures for *P. sylvestris* being 6·9, 8·4, 8·8, 23·0, and 24·9 (grand average 14). No great difference in resistance was shown between the samples of *Pseudotsuga taxifolia* from the different parts of Canada, nor was there any direct correlation between rate of growth (as indicated by specific gravity) and resistance to decay. With *Pinus sylvestris* only slight differences in resistance to decay were noted as between the samples from the different countries, indicating that resistance is not closely associated with growth rate. Both woods were about equally resistant to *M. lacrymans*, but *Pseudotsuga taxifolia* was much more resistant than *Pinus sylvestris* to the other fungi. This was especially striking in the case of *L. lepideus*. As this fungus is the chief cause of decay in imperfectly creosoted railway sleepers [ibid., xviii, p. 829], attention is drawn to the resistance of Douglas fir (difficult to impregnate with creosote) to it.

FINDLAY (W. P. K.). **Sap stain. More about its prevention by the use of chemical dips.**—*Timb. Tr. J.*, cliii, 3326, pp. 413, 415, 1940.

In this paper the author briefly discusses some of the precautions that should be taken to prevent the development of sap stain in felled sawn-up timber [*R.A.M.*, xviii, p. 364]. If the logs cannot immediately be converted, the ends and any damaged parts of the bark should be coated with a waterproof paint containing an antiseptic. If a log pond is available the best way to prevent all forms of 'degrade' is to store the logs under water. Dipping, to be effective, must be carried out immediately after sawing. In large mills a permanent dipping vat should be installed, and the timber should be conveyed by means of conveyor chains directly from the saw to the vat, in which it should remain submerged for 15 seconds. In small mills the timber may be hand-dipped, the workmen being provided with rubber gauntlets and aprons. The dipping vat may consist of a narrow wooden trough big enough to take the largest boards. If a portable tank is used it should, for convenience in handling, be about 14 ft. long, and provided with a draining board. A separate 50-gallon covered tank should be used to mix the solution, which is run into the treating vat as required. Treated timber should not be left in solid piles for more than a few days before being piled to

season, but should be stacked openly as soon as possible, under cover of a roof. With mechanically operated vats the cost of solution to dip 1,000 bd. ft. of pine (about 10 gals.) amounts to between 1*s.* and 1*s.* 6*d.* (pre-war), while with hand-dipping, reckoning labour at 8*s.* a day, the cost of dipping 1,000 bd. ft. (including price of solution) is about 2*s.* 6*d.*

SCHEFFER (T. C.) & LINDGREN (R. M.). **Stains of sapwood and sapwood products and their control.**—*Tech. Bull. U.S. Dep. Agric.* 714, 124 pp., 9 pl., 4 figs., 12 graphs, 1940.

In the Gulf States and the lower Mississippi Valley, where high temperatures and abundant rainfall prevail during most of the year, staining [*R.A.M.*, xviii, p. 363; cf. also ibid., xix, p. 57] presents a very serious problem. In mountainous and more northerly parts of the United States, characterized by lower winter temperatures and greater variation in moisture conditions, blue staining is markedly seasonal. Outside the southern States, the condition is most troublesome in the Californian pine area, and in the vicinity of northern Idaho.

Materials which, at tested concentrations, most effectively controlled stain in both pine and hardwood lumber, were a number of organic mercury compounds, sodium pentachlorophenolate, and a mixture of sodium tetrachlorophenolate and sodium 2-chloro-ortho-phenolate. Commercial soda and ammonium fluoride were effective on pine alone. Borax, certain compounds with the borate radical, and sodium tetrachlorophenolate were most effective on hardwoods only. It is suggested that there may be a differential tolerance of pine and hardwood fungi to the treatments in question.

Of the chemicals tested by the authors and now extensively used, lignasan, dowicide P, santobrite, and dowicide G may be used on softwoods and hardwood, while dowicide H may be used on almost all species except southern pines in localities immediately adjacent to the Gulf of Mexico.

For satisfactory results with any dipping or spraying treatment stain-free logs, prompt treatment, thorough coverage, adequate concentration of the chemical, protection from rain of the treating solution and the treated stock, and good seasoning practices are necessary. The data obtained indicated that, generally, treatment cannot safely be deferred longer than 24, or at most 48, hours. The concentration of the solution used should never be lower than that recommended, and in unfavourable weather may sometimes advantageously be increased.

Chemical treatments can be successfully carried out in small as well as large mills. Treated lumber can in some cases be bulk-piled for four weeks without the development of objectionable stain. In the absence of serious insect attack, satisfactory stain control in unsawn logs has been obtained for storage periods as long as 90 to 120 days by spraying the ends and barked areas. The concentrations used should generally be four to six times as high as those used for sawn logs.

B[IRCH] (T. C.). **A note on the production of creosoted fence posts by the State Forest Service.**—*N.Z. J. For.*, iv, 4, p. 257, 1 pl., 1939.

A description is given of non-pressure creosoting plants which are being established in New Zealand. The process adopted consists in immersing the barked and seasoned fence posts in creosote at 180° to

200° F. for a period that varies with the species treated, and then discharging the hot creosote and refilling the tanks with cool creosote. This 'hot and cold' process [*R.A.M.*, xv, p. 332] gives a similar penetration and absorption to that given by the pressure process. The evidence indicates that treated posts have an average service life of not less than 20 years.

Cox (T. R.). **Relation of boron to heart rot in the Sugar Beet.**—*J. Amer. Soc. Agron.*, xxxii, 5, pp. 354–370, 3 figs., 1940.

Sugar beet seedlings grown at the Michigan Agricultural Experiment Station [*R.A.M.*, xviii, pp. 76, 77] in quartz sand cultures with a nutrient solution devoid of borax developed symptoms of heart rot, which did not appear until two months after the seedlings were transplanted, owing to the available boron in the sand and seed.

The root yield was increased by up to 80 per cent. by four applications of borax at the rate of 11·9 mg. per 5 kg. sand, while definite recovery ensued when severely diseased seedlings were supplied with 4·9 mg. per pot. Halves of field-grown mother beets planted in quartz sand cultures without borax produced stunted leaves with marked symptoms of boron starvation, whereas those receiving added boron at the rate of 2 mg. per gal. pot developed more luxuriant foliage free from signs of deficiency.

Tests for available boron showed that a sugar beet crop produced in pot cultures removes a substantial quantity of boron from the soil, the following amounts, reckoned in mg. and averaged from four pots, having been detected in 25 gm. samples of soil: untreated and uncropped, 0·065; untreated, after two crops, 0·053; borax 76 mg. per pot, after one and two crops, 0·094 and 0·067, respectively; borax 304 mg. per pot, after one and two crops, 0·216 and 0·172, respectively. It was found to be relatively easy to remove added borax from soils by leaching with distilled water even as long as 14 months after application.

Warington (Katherine). **The growth and anatomical structure of the Carrot (Daucus carota) as affected by boron deficiency.**—*Ann. appl. Biol.*, xxvii, 2, pp. 176–183, 2 pl., 7 figs., 1940.

In a study conducted at Rothamsted in 1937, carrots grown in nutrient solutions containing no boron exhibited both external and internal symptoms of deficiency and eventually died, whereas the addition, renewed regularly, of boric acid within the range 1 part in 2,000,000 to 50,000 of culture solution resulted in perfectly healthy growth. The chief external symptoms of deficiency were as follows: the leaves curled back, pointed downwards, and often turned red or yellow; the laminae of the youngest leaves were much reduced and the growing apex of the shoot died; the flowering stage was not reached; and a small tap-root was formed, but the laterals were short and thickened in places. Certain additional symptoms appeared in late stages of growth in plants which had received an initial supply of boron, but were later transferred to a boron-free solution: the flowering heads bent over and died, those of the side shoots being the first to succumb, and in some cases small, wart-like excrescences developed on the outside of the tap-root. Details are given of the effect of boron deficiency on the tissues of the shoot and root.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiv, 4, pp. 81–84, 1940.

BELGIUM. A Ministerial Decree of 9th February, 1940, provides for the immediate notification of the burgomaster of a commune of any case of potato wart (*Synchytrium endobioticum*) in growing crops or stocks [*R.A.M.*, vii, p. 752]. Tubers and haulms of infected plants harvested within a radius of 2·5 m. of the focus of disease are to be collected and burnt *in situ* or buried under a cover of lime and soil at least 50 cm. in depth. The haulms of plants harvested elsewhere in the infected field are also to be burnt on the spot. The minimum area to be considered as infected will be decided by an inspector of the Phytopathological Service, without whose authorization no tubers may be lifted or transported. Material for which such a permit is granted may be used only after boiling. Potato cultivation must be suspended for seven years in areas declared to be wart-infected, except in the case of immune varieties, the growing of which may be resumed after the third year. Similar restrictions apply over a radius of 500 m. from foci of infection, except that here the cultivation of immune varieties may recommence after the first year. A written permit is required for the removal of manure from infected to other farms.

KENYA. Government Notice No. 551 of 28th July, 1939, empowers the Governor to prohibit the movement within the Colony of any plant or seed in a diseased condition or likely to spread disease and the cultivation of any crop liable to impede the proper control of a disease or pest. In any area where diseases cannot be controlled or eradicated he may declare such area to be infected and the movement of specified plants from such areas will be permitted only by special authorization.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xiv, 5, p. 102, 1940.

GERMANY. A Circular of 3rd October, 1939 (cited in the official plant protection regulations [*Beil. Nachr Bl. dtsch. PflSchDienst*], xii, 1, pp. 2–4, 1940) advocates restrictions on the cultivation of Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*] with a view to limiting the spread of *Adelopus* [*Phaeocryptopus gaeumanni*: *R.A.M.*, xviii, p. 425; xix, p. 506]. The disease caused by the latter is particularly serious in south Germany and has not yet been observed in the north. Seeds and saplings of southern origin should therefore not be supplied to northern foresters.

Dahlias and 'kromnek'.—*Rhod. agric. J.*, xxxvii, 6, pp. 318–319, 1940.

Government Notice No. 162 of 1940 prohibits the introduction into Southern Rhodesia of any *Dahlia* plants or tubers from the Union of South Africa, where the majority are believed to be infected by the 'kromnek' [spotted wilt] virus of tobacco [*R.A.M.*, xviii, p. 112]. Government Notice No. 236 of 1940 declares the aforesaid virus to be a pest within the meaning of the Tobacco Pest Suppression Act, 1933 [ibid., xii, p. 736], and specifies *Dahlia* as an alternate host [see above, p. 568], liable to destruction in cases of actual or suspected infection at the discretion of an authorized inspector. Similar powers (including the right of quarantine) may be exercised in registered nurseries by virtue of Government Notice No. 237 of 1940.

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HARKOM (J. F.). **Preservative treatment of poles by end-boring.**—6 pp., 2 figs., Ottawa, For. Prod. Lab., Canada, 1939. [Mimeographed.]

This is a full account of a cheap preservative treatment of poles, consisting in the insertion of chemicals in boles bored in the butt, reference to which has already been made [*R.A.M.*, xix, p. 507].

McWHORTER (F. P.) & OWENS (C. E.). **Vein banding virus disease of Parsnips.**—*Plant Dis. Reptr*, xxiv, 9, p. 176, 1940. [Mimeographed.]

The young foliage of a few parsnips in a commercial planting in Oregon showed a chlorotic condition developing along the veins and expanding into disfiguring blotches. The appearance of the leaves thus affected is quite different from those attacked by western aster yellows, as reported by Severin [from California] (*Hilgardia*, vii, p. 177, 1932), and may be due to a hitherto undescribed virus.

JAGGER (I. C.) & WHITAKER (T. W.). **The inheritance of immunity from mildew (Bremia lactucae) in Lettuce.**—*Phytopathology*, xxx, 5, pp. 427–433, 1940.

The occurrence of five distinct physiologic races of *Bremia lactucae*, the agent of downy mildew of lettuce, is stated to be definitely established by observations and experiments in California [*R.A.M.*, xii, p. 417], while other evidence points to the existence of six or seven [ibid., xviii, p. 8]. In this paper the inheritance of immunity from race 5 among the progeny (down to F_3) of crosses between the susceptible Imperial F, D, 615, and 847 and the immune Grosse blonde d'hiver bourgignonne (Vilmorin-Andrieux) and a Russian strain of *Lactuca scariola* is described in detail, and was found to be dependent in a single dominant gene. Such genes have been detected only among the more primitive types of lettuce of European origin [loc. cit.], and no evidence of linkage could be traced between them and those responsible for the various morphological characters of the cultivated varieties.

The development of physiologic races of *B. lactucae* through mutation is inferred from circumstantial evidence, based in the first place on the mode of their appearance, and secondly on the fact that resistance to at least two is controlled by single gene differences.

Klushnikova (Mme E. S.). Четырехспоровая дикая **Psalliota campestris,** ее особенности и отличия от культурной двухспоровой формы шампиньона. [The characteristics of the four-spored wild *Psalliota campestris* and its differentiation from the two-spored cultivated mushroom.]—*Bull. Soc. Nat. Moscou,* Sect. Biol., N.S., xlviii, 5–6, pp. 53–58, 11 figs., 1939.

In a comparative study of wild and cultivated mushrooms, fruit bodies of the wild, four-spored form of *Psalliota campestris* [*R.A.M.*, xvi, p. 365], collected near Moscow, were found to be morphologically very similar to those of the cultivated white form. The spores of the wild form, however, germinated after 15 days as compared with 8 to 9 for those of the cultivated form, and lost their viability after 7 to 8 months, while those of the cultivated form were capable of germination after two or three years. Whereas the cultivated form is normally grown on horse manure, the mycelium of the wild form did not develop on sterilized fresh horse manure, but throve on horse manure mixed with 50 per cent. garden soil. In view of these cultural differences the two forms are considered distinct. The results of cultural and cytological studies indicate that the wild form is homothallic.

Mahoney (C. H.) & Stier (H. L.). **Influence of new sprays and dusts in the control of Cantaloupe defoliation and improvement of fruit quality.**—*Trans. Peninsula hort. Soc.,* xxix (*1939*), 5, pp. 162–165, [? 1940].

During 1939, a test was carried out in Maryland in which replicated plots in 12 acres of Pearl Pink Meat cantaloupe melons received 8 applications of either Bordeaux mixture [concentration unspecified], cuprocide (red copper oxide) 54, cuprocide 54–Y, Grasselli compound A, basicop, or duo-copper sprays, or copper sulphate cuprocide G–A, yellow copper oxide, or cupro-K dusts. As far as possible the same amount of metallic copper was applied per acre in all treatments, except in the case of the plots sprayed with Bordeaux mixture, which received approximately 25 per cent. more than the others.

The first disease to appear (20th July) was powdery mildew [*Erysiphe cichoracearum*: *R.A.M.*, xviii, p. 151]; this was followed by downy mildew [*Pseudoperonospora cubensis*: ibid., xiii, p. 286] on about 25th July, and by *Macrosporium* [*Alternaria* ? *cucumerina*: ibid., xvii, p. 364] in the first week in August. The best control of both mildews was given by Bordeaux mixture, yellow copper oxide spray, and red copper oxide dust. All the treatments were less effective in controlling *A.* ? *cucumerina* than in controlling the mildews; the most effective control was given by red copper oxide spray. The rates of application were as follows: early (late June), when the vines were beginning to run, 70 gals. spray and 16 lb. dust per acre; mid-season (to mid-August), 90 to 115 gals. and 30 lb., respectively; late 230 gals. The double-rate late spray gave a marked increase in the control of *A.* ? *cucumerina,* and clearly demonstrated the importance of good coverage, which, apparently, may be more important, in the case of this disease, than the form of fungicide used. Sprayers in commercial fields must have at least 300 lb. pressure at the nozzle, and the lower surface of the leaves should be covered.

Bottomley (A[veril] M.). **Sclerotium or footrot disease of Groundnuts.**—*Fmg S. Afr.*, xv, 170, pp. 189–191, 194, 3 figs., 1940.

In the northern Transvaal the most destructive and widespread disease affecting groundnuts is foot rot, due to *Sclerotium rolfsii* [*R.A.M.* xvii, p. 442; xix, p. 196]. The first serious outbreak occurred locally in 1936–7; infection was not much in evidence in 1937–8, but during the past two seasons the attacks have reached such alarming proportions in some districts that the future of the industry will be jeopardized if prompt measures are not taken to control the disease. Infected plants show one or more wilted or dead shoots or may appear to be conspicuously healthy and robust. In the case of the former the base of the stem just below soil-level is rotted through, while in that of the latter it is usually decayed except for a bundle of fibrous threads in the centre. Nutriment passes from the roots to the leaves through these threads, and until they become infected the plant does not appear to be diseased. This healthy appearance is attributed to the accumulation in the leaves of food which in normal conditions would pass to the nuts.

As the sclerotia require a great deal of moisture for their development, the disease is slight in dry, and severe in wet, seasons, especially if the rain falls in continuous spells. Infection is reduced in cold weather, and as the fungus cannot live without air it occurs only in the top 5 in. of the soil. The condition appears to be equally bad in all soil types found in the area concerned.

The only effective control consists in the use of resistant varieties. These, however, are all decumbent types unsuited to the local conditions. The best method of prevention is crop rotation. A cereal should follow immediately after diseased groundnuts, and should be planted, preferably, for two years. In the third year another legume, such as soybean, should be grown, after which the soil will have been cleared of infection to a considerable extent. Seed should be taken from a healthy crop, and should be fully mature, and of good size. Seed disinfection with mercurial dusts is recommended, since this destroys superficial infection and protects the seedling from attack by moulds. Deep ploughing also assists in control. The use of kraal manure on infected land is not advised. Virgin soil should be planted to a non-susceptible crop for a year or two before groundnuts are planted. Clean sanitation is of great importance, and cattle fed on diseased plants may spread infection.

Williams (T. L.). **Progress made in the production of varieties of Cassava resistant to mosaic disease.**—*Pap. Third W. Afr. agric. Conf., 1938* (Gold Coast Sect.), i, pp. 45–60, [? 1940].

A comprehensive, fully tabulated account is given of experiments in progress since 1933 at Kumasi, Gold Coast, in the development of mosaic-resistant cassava varieties [*R.A.M.*, xviii, p. 727]. Pedigree seedlings were produced by crossing one of the more resistant local varieties, e.g., Calabar Long Period No. S 115, with a susceptible imported or local variety, using the former as the male parent, and also by hybridization between pairs of resistant and susceptible varieties and between 'tree' cassava and the ordinary type. In 1936–7 six out of 32

of the 1933–4 pedigree strains remained free from infection in field experiments in which rows of heavily infected cuttings were interplanted with the selected seedlings, and two of these, C. 50 and C. 282A, with 8·2 and 12·2 per cent. mosaic compared with about 100 per cent. in the controls, were retained for further trial as combining tolerance of the disease with a reasonably palatable flavour and a low hydrocyanic acid content. Ten out of the twelve 1934–5 pedigree strains remaining immune were also retained for further experiments, and the preliminary results of the 1937–8 trials were favourable in respect of six. Up to the time of writing 31 out of the 62 healthy 1936–7 seedlings were free from mosaic at all the testing stations.

Cassava mosaic is much more severe near the coast than in the forest country, and the incidence of the disease reaches a climax towards the end of the rains and during the commencement of the dry season. The amount of infection on the above-mentioned selections, C. 50 and C. 282A, varied considerably at the different stations, the maximum for the former (11·5 per cent.) being reached at Aburi and the highest figure for the latter (23·4 per cent.) at Asuansi. The low incidence (0·0 per cent.) for both strains at Kumasi suggests a correspondingly small population of the insect vector of mosaic, *Bemisia nigeriensis*, in that district.

BRIANT (A. K.) & JOHNS (R.). **Cassava investigations in Zanzibar.**—*E. Afr. agric. J.*, v, 6, pp. 404–412, 1940.

In Zanzibar the incidence of cassava mosaic [see preceding abstract] is very high in all districts, an average of at least 60 to 75 per cent. of the plants being affected. In a variety trial in 1937 the local cassava variety Msitu gave a significantly better yield than six other varieties tested; there was a wide, but not a significant, difference between the yield of this variety and that of the next best, F. 100. In a further trial in 1938–9, Msitu, Mpezaze, and Kru (the last-named from the Gold Coast) gave significantly heavier yields than the five other varieties tested: F. 100, F. 64, E. 20, Sareso, and Pamba Mangubu, arranged in descending order of yield. A further test in which these and other varieties were grown in close proximity to infected cassava gave similar results. The [tabulated] data from varietal trials showed that the average yield of healthy plants is much higher than that of plants of the same variety with primary infection (i.e., symptoms exhibited on first leaves). Hence, yields may be considerably increased by planting only healthy cuttings and by replacing young diseased plants by healthy cuttings as soon as infection appears. The difference between the yields of healthy plants and those with secondary infection (i.e., acquired after planting) was not very marked. With few exceptions, the higher the total yield of a particular variety the fewer the plants in it with primary infection. Primary infection reduced the average yield of single plants of all varieties to a very low level, e.g., from 9·1 to 0·5 lb. for Kru, and from 11·3 to 4·9 for Ankrah, the first figure in each case being the average yield per healthy plant.

The small number of new infections recorded in the dry periods July–August (6), August–September (3), and December–January (8) would appear to have been due to the climatic conditions prevailing during

the preceding rainy periods (April–May, 13·04 in., May–June, 10·44, October–November 13·13, and November–December, 15·11).

SHEPHERD (E. F. S.). **Cocoyam root rot in the Gold Coast.**—*Pap. Third W. Afr. agric. Conf., 1938* (Gold Coast Sect.), i, pp. 83–86, [? 1940].

Summing up the results of protracted investigations, by H. A. Dade and J. Wright (presented by the former in hitherto unpublished notes covering the period from 1925–1933), on the root rot of coco-yams (*Xanthosoma sagittifolium* and *Colocasia antiquorum*) in the Gold Coast [*R.A.M.*, xix, p. 262], the writer reviews the present situation with regard to the disease, incorporating his own observations during a few months (at the time of writing) in the Colony. Plants growing in garden compost or uncleared bush do not suffer from the disease, which is prevalent in cleared land and persists in subsequent cultivation for at least three years. Rotted yams transferred to garden compost recover, while it was found impossible to induce artificial infection in plants growing in this medium by any of the usual methods. The rot is not correlated with any of the ordinary soil deficiencies or with the soil reaction.

It is apparent from these data that some specific agent or agents must be responsible for the trouble, and the facts that it is gradually spreading and that healthy stock immediately succumbs on transference to affected areas is strongly suggestive of parasitic infection. Attempts to secure evidence of the primary involvement of *Rhizoctonia* [*Corticium*] *solani* and *Pythium* sp. aff. *gracile*, the two fungi associated with the disease, have so far given inconclusive results, and these organisms would seem to be subsidiary to some soil-inhabiting pathogen (or a toxin in Wright's opinion), possibly a bacterium or a new type of virus, capable of attacking coco-yam roots in soils containing the decaying roots of undergrowth left in the ground according to the common local practice. *C. solani*, though frequently isolated in pure culture from diseased root tissue, has also been found in association with the roots of healthy plants in areas where the rot has never been recorded.

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1939.** [Review of phytopathological records noted in 1939.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 1, pp. 1–70, 12 figs., 1940.

This report [cf. *R.A.M.*, xix, p. 68] contains numerous items of phytopathological interest, of which the following may be mentioned. Spraying tests against vine mildew (*Plasmopara viticola*) in different parts of Italy with Casale's mixtures showed that both the acid form (200 gm. copper sulphate, 50 gm. citric acid, and 50 gm. sodium carbonate per 100 l. water) and the neutral (200 gm. copper sulphate, 200 gm. sodium sulphate, 50 gm. citric acid, and 200 gm. calcium carbonate per 100 l. water, with the addition at the end of summer of 200 gm. of ferrous sulphate to increase adhesiveness) gave encouraging results. The two mixtures are almost as effective as Bordeaux mixture during the period when spray applications are very frequent, and provided the season is not very wet. In 1939 the acid mixture again caused leaf scorch. Attempts to control olive knot (*Bacterium* [*Pseudomonas*] *savastanoi*) [ibid., xviii, p. 330] in the Razzo variety growing on a

hillside by cutting away the infected parts and disinfecting the wounds with zinc chloride failed to prevent the disease from spreading, though the same variety growing lower down in the valley remained almost entirely unaffected. Olives in several localities were severely affected by *Cycloconium oleaginum* [ibid., xvii, p. 405]. Groves treated in October, 1938, and May, 1939, with Bordeaux mixture or either of two mixtures containing calcium cyanamide remained perfectly healthy. At Rieti many young olives succumbed to infection by *Dematophora* [*Rosellinia*] *necatrix* [ibid., xvi, p. 688], compacted soil being a predisposing factor.

Pear branches and shoots were attacked by canker (*Nectria galligena*), and apple fruits from Bologna by *Schizophyllum commune*. *Cercospora circumscissa* [ibid., xvii, p. 507] and *Phyllosticta persicae* occurred on peach leaves from Littoria, and loquats were extensively attacked by *Fusicladium dendriticum* var. *eriobotryae* [ibid., xvii, p. 556]. Leaves of *Zizyphus vulgaris* [*Z. jujuba*] showed reddish spots due to *Septoria capensis*. *Ascochyta heteromorpha* [ibid., xiii, p. 308] caused infection of oleanders in two localities; in several other districts the same host was attacked by *Bact. tonellianum* [ibid., xiii, p. 748]. Mulberry leaves from Italian East Africa showed the presence of *Bact. mori* and a species of *Phyllosticta* which formed ashy-white colonies with pycnidia containing oval or ellipsoidal conidia, reddish-cream in the mass, 4·5 to 5 by 2·4 to 4 μ, with darker plasma at each extremity; the mycelium showed numerous uni- or bicellular chlamydospores, which were darker than the light chestnut-coloured hyphae.

Owing to the exceptionally wet spring wheat in several localities became attacked by *Gibberella saubinetii*. Foot rot of the same host was associated with *Leptosphaeria herpotrichoides* and *Fusarium* sp. *Septoria nodorum* was common on wheat, *S. tritici* and *S. graminum* being of less importance. The variety Girolamo Caruso at Fiume was infected by *S. glumarum*.

Lupinus luteus showed root rot due to *Sclerotinia sclerotiorum*. Near Rome the same host showed severe infection of the leaves, stems, and leaf stalks by *Macrosporium* [*Stemphylium*] *sarciniforme* [ibid., xviii, p. 116]. Tomatoes were infected by *Bact. vesicatorium* and *Pseudomonas* [*Bact.*] *solanacearum*.

Gladiolus at Viareggio showed dry rot due to *Fusarium oxysporum* var. *gladioli* [ibid., xvi, p. 335].

Alexopoulos (C. J.). **Some fungi from Greece.**—*Mycologia*, xxxii, 3, pp. 336–358, 43 figs., 1940.

This annotated, illustrated list of parasitic fungi collected by the author in Greece between October, 1938, and April, 1939, or identified by him, includes *Actinomyces scabies* on potatoes (causing great damage throughout the country); *Lophodermium pinastri* on leaves of *Pinus halepensis* (the first record of this fungus from Greece); *Gymnosporangium sabinae* on pear trees (very common, causing considerable damage in all localities); *Uromyces appendiculatus* on leaves of *Phaseolus vulgaris* (found wherever beans are grown); *Septoria piricola*, the conidial stage of *Mycosphaerella sentina* (causing much damage to pear leaves in all localities); *S. tritici* on wheat from Larissa (reported to have caused 15 to 25 per cent. infection in the field where the specimen was collected);

Ascochyta pisi on broad bean leaves; *Oidium leucoconium* [*Sphaerotheca pannosa*] on peaches and roses (common, and causing considerable damage); *Botrytis cinerea* on mature grapes (very damaging); and *Macrosporium vitis*, a fungus new to Greece, also on mature grapes.

PADWICK (G. W.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst., New Delhi, 1938–9*, pp. 103–115, 1940.

The following are among the items of interest in this report [cf. *R.A.M.*, xviii, p. 499]. Progress is reported in breeding wheat varieties resistant to loose smut [*Ustilago tritici*: ibid., xviii, p. 585], others resistant to flag smut [*Urocystis tritici*], and oats resistant to [covered] smut [*Ustilago kolleri*], a number of resistant varieties being obtained in each case.

Some 50 per cent. of the maize seedlings growing in soil inoculated with a *Pythium* associated with a severe attack of root rot in Bihar were killed, the pathogen being reisolated from the roots.

Natural transmission of sugar-cane mosaic through the agency of aphids has been shown to occur to a slight extent in various parts of northern India, and in one locality in the Punjab *Aphis maidis* has been found colonizing on sorghum and an indigenous thin reed cane. A barley crop was found to be infested by *Toxoptera graminum*, another vector of the disease [ibid., xvii, p. 555]. In the same district a ratoon cane crop adjoining an aphid-infested sorghum stand developed 100 per cent. mosaic on the side next to the sorghum but none on the opposite side of the field. The rate of natural transmission is low and disease-free cane may be produced from setts cut from infected canes [ibid., xviii, p. 500] so that the rate of increase of mosaic in the crop grown year after year need not necessarily be very great. Highly successful results have been obtained by selecting setts from healthy canes in a very heavily infected crop; at Pusa, for instance, a stand raised from selections from a crop of Co. 313 with 70 to 90 per cent. infection developed only 3 per cent. mosaic.

Roguing has been found to give rapid and effective control of sugar-cane smut (*U. scitaminea*). The incidence of top rot (*Fusarium moniliforme*) [*Gibberella fujikuroi*] at Delhi on the Co. 313 variety ranged from 2·4 to 20·8 per cent. in three different plots. No evidence of loss of weight from the disease in the Co. 312, 313, 285, and 223 varieties was obtained, the same applying to Surkha Saharanpuri at Karnal. Up to 33 per cent. infection by *Bacillus* [*Bacterium*] *rubrilineans* was observed in some of the 85 varieties studied at the Sugar-Cane Research Station in the Punjab in a severe outbreak of red stripe.

Spores of linseed rust (*Melampsora lini*) were found to germinate better in distilled than in tap water, the optimum temperature for the process being 22° C., with a range from 10° to 25°. Spores from two separate collections of the rust from Pusa and Karnal were used for the inoculation of linseed type Pusa 21 and flax variety J.W.S.; the latter strain produced very heavy infection on Pusa 21 and none on J.W.S., whereas the former was only moderately pathogenic to Pusa 21 and slightly so to J.W.S. These results are considered to point to the existence of two physiologic races of *M. lini* in India.

Pending a decisive outcome of the experiments in progress to determine the identity of the *Fusarium* causing gram [*Cicer arietinum*]

wilt, no conclusion can be reached as to its taxonomic status, whether a new species or merely a physiologic race of *F. orthoceras* var. *pisi*. The disease was shown to be closely correlated with high temperatures, and to be equally severe in unsterilized and sterilized soils, indicating the absence of biological antagonism as a controlling factor. Late sowing (coinciding with a fall in temperature) was shown by a replicated field experiment to reduce the incidence of wilt (from 11·5 per cent. in the 30th September sowing to 0·1 and 0·0 per cent., respectively, in those of 21st and 28th October).

The results of cross-inoculation tests to determine the connexion between the *F.* spp. responsible for pigeon pea and sann hemp [*Crotalaria juncea*] wilts denoted a fairly high degree of specificity in the two fungi in relation to their appropriate hosts: the pigeon pea strain (12 isolates) infected up to 10 out of 24 seedlings of its own host and 6 out of 23 *C. juncea* (one isolate only), while the *C. juncea* strain attacked up to 11 out of 23 seedlings of its own host and one out of 24 pigeon peas (one isolate only). *F. vasinfectum* from *C. juncea* was pathogenic to 2 out of 24 pigeon peas and 7 out of 23 *C. juncea*.

None of the 50 tobacco plants to which white flies (*Bemisia gossypiperda*) fed on the juice of plants infected by leaf curl were transferred contracted the typical symptoms of the disease [ibid., xviii, p. 499; xix, p. 568]; though 11 showed vein-clearing with an approximation to leaf curl in 5.

F. sp. and *Colletotrichum* sp. were the principal organisms isolated from betel vines (*Piper betle*) [ibid., xviii, p. 234] affected by severe wilt or root rot in central India.

The histological examination of banana suckers from Cuttack, Orissa, whence widespread decay of the crop was reported, gave strong indications of the implication of the destructive bunchy top virus in the condition. [In the Annual Report of the Department of Agriculture, Assam, for 1937–38, p. 67, 1939, the Economic Botanist (S. Hedayetullah) records the presence of the same disease in dwarf bananas in the Bahara region.]

In the course of fortnightly inspections of the Delhi markets, scab [*Venturia inaequalis*] in the *Fusicladium* stage was found causing infection of up to 80 per cent. of the apple consignments from the Punjab and United Provinces. *Aspergillus japonicus* was shown to be responsible for losses amounting to 20 per cent. among pears [ibid., xviii, p. 188]. These surveys have shown that imported fruits are much less liable to spoilage than the corresponding Indian produce, in which the trouble usually originates from injuries inflicted before or during transport. Damage of this type, frequently involving very heavy losses, is more or less restricted to certain districts.

Plant diseases. Notes contributed by the Biological Branch—*Agric. Gaz. N.S.W.*, li, 6, pp. 327–330, 3 figs., 1940.

Banana-growers in New South Wales seeking to profit by an intercrop are warned that if the seed of such intercrop carries even a trace of the virus of infectious chlorosis or heart rot [a strain of cucumber virus 1: *R.A.M.*, xix, p. 482] and an aphid infestation occurs during autumn, many young banana plants will be destroyed. As cowpeas are suscep-

tible [ibid., xv, p. 196], it is considered to be highly probable that losses may occur where these are used as a cover crop, particularly if they are not disposed of in early autumn.

Potatoes in New South Wales are stated to be affected by brown fleck or internal brown spot [cf. ibid., xvii, p. 160], characterized by brown or yellow regions of dead tissue scattered throughout the tuber. The condition occurs chiefly on light, gravelly soil in dry seasons. Land conducive to its development should be avoided, and though there is no evidence of transmission by tubers, affected tubers should not be used as seed-stock.

WENHOLZ (H.), PRIDHAM (J. T.), VEARS (C. K.), & CURTEIS (W. M.). **Wheat varieties in Australia.**—*Agric. Gaz. N.S.W.*, xlix, 11, pp. 583–586; 12, pp. 649–652; l, 1, pp. 13–17; 2, pp. 71–74, 86; 3, pp. 131–135; 4, pp. 181–184; 5, pp. 236–238, 284; 6, pp. 308–311; 7, pp. 361–365; 8, pp. 417–420; 10, pp. 539–543; li, 1, pp. 11–14, 30; 2, pp. 65–68; 3, pp. 133–137; 4, pp. 195–198; 5, pp. 242–244; 6, pp. 312–314, 347; 7, pp. 371-373, 397, 42 figs., 1938–1940.

In this series of papers the authors give descriptive notes on all wheat varieties bred or produced in Australia, as well as on introduced varieties that have been of significance in cultivation or breeding work on the continent. Reaction to disease is specified in the case of many varieties.

WADDELL (W. H.). **A study of the relation between the seedling and mature-plant reaction to Puccinia graminis tritici in Durum Wheat-crosses involving Iumillo.**—*Canad. J. Res.*, Sect. C, xviii, 6, pp. 258–272, 1 fig., 1940.

All seedlings of three durum wheat crosses, Iumillo × Mindum A and B, and Pentad × Iumillo, found to be resistant to *Puccinia graminis tritici* race 21 in the greenhouse, were likewise resistant to all the races of the rust in the field in the mature stage; those found susceptible in the greenhouse were also susceptible in the field. A third group comprised lines that were susceptible in the seedling stage, but resistant as mature plants. It was observed, however, that as susceptibility increased in the seedling stage, there was an increase in the amount of rust in mature plants. The variety Iumillo appears to possess a factor or factors for mature plant resistance and another or others for resistance at both stages of maturity. The reaction to rust in the hybrid lines does not seem to be inherited in a simple Mendelian manner, being influenced in the Iumillo × Mindum crosses by the two types of resistance in Iumillo, and in the Pentad × Iumillo crosses also by additional factors for resistance in the Pentad parent. Seed colour was inherited in the Iumillo × Mindum crosses in a simple 3 : 1 ratio, red seed being dominant. There appeared to be no correlation between seed colour and rust reaction. It is concluded that for breeding purposes greenhouse tests with only one race of the rust can be employed for the elimination of susceptible lines of durum wheat crosses involving Iumillo.

RICE (W. N.). **The hemocytometer method for detecting fungous spore load carried by Wheat seeds.**—*Proc. Ass. Off. Seed Anal. N. Amer.*, *1939*, pp. 124–127, 1940.

The following method was used for the estimation of the spore load

of various fungi carried by wheat seeds. One hundred seeds of a given lot are placed in a test tube together with 5 ml. of water, and the tube is corked and shaken fifty times, since separate experiments indicated that about 85 per cent. of spores were thus washed off. A drop of the suspension is then placed on the haemocytometer and the cover glass immediately set in place; the spores are counted in the measured volume of the haemocytometer from which the number of spores per kernel is readily calculated. It was found by the chi-square test that counting the number of spores in a quarter of the field of five different mounts gave a better estimate of spore load per kernel than by counting the spores in the whole field of a mount. An examination of wheat samples showed a range of from 59 to 22,344 *Tilletia* spores, 0 to 10,584 *Alternaria* or *Macrosporium* spores, and 0 to 59 *Helminthosporium* spores per kernel. Samples of seed in which no spores of *H. sativum* were detected by this method, nevertheless developed typical symptoms of disease and it is concluded that spore load alone is not an adequate criterion for the extent of probable injury to germination by this fungus.

GRACE (N. H.). **Effects of two preparations of naphthylacetic acid on the germination and early growth of Wheat seed damaged by formaldehyde.**—*Canad. J. Res.*, Sect. C, xviii, 6, pp. 215–218, 1940.

In further experiments on the response of formaldehyde-treated wheat seed-grain to naphthylacetic acid [*R.A.M.*, xix, p. 206], seeds of Marquis and Reward wheats were sprinkled either with formalin (37 per cent. by weight) alone or a solution containing formalin (1 in 320) and naphthylacetic acid (5 and 50 p.p.m.) at the rate of 10 c.c. to 50 gm. of seed, effecting treatments of 1 and 10 parts of the acid to 1,000,000 of wheat by weight. Two preparations of the acid were used, one of which had a trace of halogen. In both varieties of wheat formalin alone reduced the average germination rate (from a mean of the two varieties of 0·613, as computed by Bartlett's method (*J.R. Statist. Soc. Suppl.* iv, pp. 137–183, 1937), for the untreated control to 0·572), the final germination count (from 41·1 to 36·9 per cent.), and the air-dry weight of stems (from 0·736 to 0·601) and roots (from 0·264 to 0·172) at 29 days after planting, the corresponding figures for treatment with formalin and naphthylacetic acid (1 and 10 p.p.m.) being 0·608 and 0·564, 38·5 and 38·7, 0·645 and 0·628, and 0·194 and 0·188, respectively. Some reduction of formaldehyde injury therefore resulted from the 1 p.p.m. concentration of hormone, but the 10 p.p.m. concentration had no significant effect. The presence of a trace of halogen did not influence final germination or stem and root weights, but increased the germination rate. This effect was more marked at the highest concentration and Marquis was affected to a greater extent than Reward.

VANTERPOOL (T. C.). **Studies on browning root rot of cereals. VI. Further contributions on the effects of various soil amendments on the incidence of the disease in Wheat.**—*Canad. J. Res.*, Sect. C, xviii, 6, pp. 240–257, 4 figs., 1940.

In further experiments on the browning root rot of wheat, associated with *Pythium* spp. (including *P. arrhenomanes* and *P. tardicrescens*) [*R.A.M.*, xv, p. 141; xviii, p. 165], phosphatic, nitrogenous, and potassic

fertilizers (at rates equivalent to 100 lb. phosphorus pentoxide, 96 lb. nitrogen, and 98 lb. potassium oxide per acre) were added at the time of planting to pots of soil naturally infested with *Pythium* spp. An improvement in growth resulted from the application of phosphorus; nitrogen applied singly had little effect, but when both were applied together, the increase in growth was greater than with phosphorus alone. Phosphorus appeared to be the chief deficient element. The phosphates, especially those containing nitrogen, increased the number and length of crown roots, the number of tillers, and the dry weight of plants, but had little, if any, effect in increasing the resistance of the plant tissue. The beneficial effect of phosphorus is believed to lie in the fact that by stimulating root development it helps the plants to escape infection. The phosphate-fixing power of infested and normal soils did not differ appreciably. Typical browning soils were not found to be seriously lacking in boron, copper, manganese, or zinc. Substantial increases in the growth of wheat seedlings in infested soil resulted from the application of either gypsum or triple superphosphate and from the two combined, as well as from heavy applications of sulphur, and addition of farm manure, ground cereal straw, sweet clover [*Melilotus*] hay, and weed hay. Browning soil was found deficient in phosphate for non-cereal crops such as lucerne, buckwheat, carrots, flax, lettuce, and sweet clover. These crops were not attacked by *P.* spp. parasitic on cereals and their poor growth is ascribed entirely to phosphate deficiency, while in wheat it is believed to be due to parasitic fungi as well. The results of this study are taken to indicate that browning root rot is due to lack of nutrient balance and depletion in soil fertility, factors predisposing the seedlings to attacks by the root-destroying fungi. It is suggested that artificial fertilizers and organic residues or manure should be applied to soils subject to this disease.

Putterill (Miss K. M.). **Two important foot-rots of Wheat and Barley.** —*Fmg S. Afr.*, xv, 171, pp. 219–220, 1940.

Foot rots of wheat and barley are stated to cause yearly increasing damage in the grain-growing areas of the northern Transvaal. The two most important are the common form of foot rot caused by *Helminthosporium sativum* [*R.A.M.*, xviii, p. 513] and a number of associated fungi, and the take-all disease caused by *Ophiobolus graminis* [ibid., xix, p. 335]. The control measures recommended against these two diseases include, for the former, the use of clean seed, seed disinfection with agrosan or ceresan, crop rotation over a minimum period of two years, wheat or barley being planted after a leguminous crop, and the application of complete fertilizers to the soil; and for the latter crop rotation over two years, preferably with legumes as an alternative crop, and early fallowing of the soil after an infected crop.

Young (V. H.) & McClelland (C. K.). **Seed treatments for Corn, Oats, and Barley in Arkansas.**—*Bull. Ark. agric. Exp. Sta.* 389, 27 pp., 1940.

Some of the data assembled in this bulletin on oats and maize seed-grain disinfection have already been published [*R.A.M.*, xiii, pp. 157, 503]. Fulghum oats from plots badly affected with loose smut (*Ustilago*

avenae) the preceding season were planted each year from 1933 to 1936. Beginning with 20 per cent. of diseased panicles in 1932, the incidence of loose smut had increased to nearly 50 per cent. by 1936. Untreated seed-grain from apparently healthy plots invariably gave rise to between 3 and nearly 12 per cent. smutted panicles, but almost perfect control of the disease resulted from the application of the formaldehyde spray (*Misc. Publ. U.S. Dep. Agric.* 21, 1928), dip, or dust (corona oat dust), or 2 per cent. ceresan (3 oz. per bush.). No evidence was obtained of the exertion of any stimulatory action by ceresan. The results of experiments on Missouri Beardless barley from 1936 to 1938, inclusive, may be summarized as follows. Both *Ustilago nuda* and *U. nigra* were concerned in the causation of loose smut, as indicated by the favourable response of the seedling phase of the disease to superficial treatment with new improved ceresan, which would obviously be ineffectual against internal (blossom) infection. The average incidence of loose smut in the three years in the lots treated with new improved ceresan ($\frac{1}{2}$ oz. per bush.), hot water (one minute at 120° F. and 13 at 126°, preceded by six hours' soaking at room temperature), and formaldehyde (1 pint in 40 gals., room temperature) was 4·48, 0·22, and 5·38 per cent., respectively, compared with 6·94 for the untreated controls, the corresponding figures for covered smut (*U. hordei*) being 0·02, 2·52, 1·55, and 6·16 per cent., respectively; no significant differences in the yields were found. Definite indications were available that new improved ceresan conferred protection against the soil as well as the seed-borne spores of both smuts, whereas the other two methods were effective against the latter only.

ROSEN (H. R.) & WEETMAN (L. M.). **Longevity of urediospores of crown rust of Oats.**—*Bull. Ark. agric. Exp. Sta.* 391, pp. 20, 1940.

This is an expanded, tabulated account of the writers' studies on the longevity of the uredospores of physiologic race 1 of crown rust of oats (*Puccinia coronata avenae*) the outcome of which, denoting the unimportance of this factor in relation to the perpetuation of the disease under Arkansas conditions, has already been noticed from another source [*R.A.M.*, xviii, p. 306].

STIEMENS (BRENDA). **Survival of fungi in the digestive tract of cattle.**—*S. Afr. J. Sci.*, xxxvi, pp. 220–224, 1939.

In an experiment carried out in South Africa *Diplodia zeae* on oats (20 gm.) was fed to each of two oxen daily from 22nd to 26th February, 1939, a third ox receiving on the same dates 40 gm. oats infected with *Gibberella saubinetii*. Examination of the faeces, made daily from 23rd February until 1st March, showed that the spores of *D. zeae* recovered were no longer viable, and failed to germinate on fresh manure. In turnip extract plus manure fresh spores germinated but failed to develop further. No spores of *G. saubinetii* were recovered, fresh spores of the same fungus also making no growth on manure. The infection of plants by these fungi through manure is therefore considered only a very remote possibility.

BARRE (H. J.). **Results of research in Corn storage.**—*Agric. Engng, St. Joseph, Mich.*, xxi, 6, pp. 219–222, 2 figs., 2 graphs, 1940.

In connexion with a study in Illinois and Iowa on the various phases

of maize storage, a survey of cribs in September, 1938, revealed a high incidence of [unspecified] mould in those with defective roofs. Observations were made to the effect that early-picked maize with a high moisture content is liable to contract mould damage within a few weeks of placing in the crib under warm-weather conditions, a fact that should be considered in weighing the relative advantages of early harvesting and the superior quality of a drier product.

HOPPE (P. E.). **Relative prevalence and geographic distribution of various ear rot fungi in the 1939 Corn crop.**—*Plant Dis. Reptr*, xxiv, 11, pp. 210–213, 1940. [Mimeographed.]

The 1939 platings on potato dextrose agar of samples of damaged maize kernels taken from car-loads at terminal markets in the United States [cf. *R.A.M.*, xviii, p. 669] showed that in Maryland and Delaware ear rots were about 2½ times as prevalent in the field as they were in the Corn Belt States. The most prevalent fungi isolated from the two seaboard States were (in descending order) *Diplodia zeae*, *Fusarium moniliforme* [*Gibberella fujikuroi*], and *G. saubinetii*, which together accounted for about 75 per cent. of the damage. The incidence of the last-named fungus was below its average for seven years. In Ohio, Indiana, and Illinois approximately 75 per cent. of the damaged kernels gave *D. zeae* and in Minnesota, Iowa, and Missouri 56·6 per cent., while only 17·4 of the Iowa samples gave *G. fujikuroi*. In Kansas, Nebraska, Colorado, and Texas *G. fujikuroi* was, as usual, the predominant fungus. The tendency for the ratio of *Aspergillus* spp. to *Penicillium* spp. to increase in the western and south-western areas of the United States was again observed.

Mould in sliced bread.—*Aust. Baker*, xliii, pp. 21–26, 1940. [Abs. in *Aust. chem. Abstr.*, ii, p. 21, 1940.]

Microban, a propionic acid salt, is claimed to be an effective deterrent of mould growth in bread at the rate of 3 oz. per 100 lb. flour [*R.A.M.*, xix, p. 528].

EDWARDS (E. T.). **The biological antagonism of Gibberella fujikuroi and Gibberella fujikuroi var. subglutinans to Trichoderma viride, with notes on the pathological effects of the latter fungus on Maize.**—*J. Aust. Inst. agric. Sci.*, vi, 2, pp. 91–100, 3 figs., 1940.

In the course of a study in Wisconsin on the seedling blight diseases of maize caused by *Gibberella fujikuroi* and its var. *subglutinans* [*R.A.M.*, xix, p. 469], it was observed in an appreciable number of cases that maize seedlings derived from either inoculated or internally infected kernels made better growth and were considerably more vigorous than the controls raised from uninoculated seed grains. It was further found in two series of experiments, in which the same observation was made on maize seedlings growing at 28° C., that the control seedlings, which were stunted and uneven in growth, yielded profuse quantities of *Trichoderma viride*, no trace of which could be detected in the seedlings grown from inoculated kernels. These observations are explained on the basis of an antagonistic relationship between the two types of *Gibberella* and *T. viride*, the latter being inhibited in the presence of either of the

former. A limited number of experiments to demonstrate such a relationship in culture, however, gave negative results. The attention is drawn to the pathological effects of *T. viride* on maize, although it is not yet known whether these effects are due to active parasitism on the part of the fungus or to toxic substances secreted by the fungus after it has become established as a saprophyte.

VAN DER PLANK (J. E.), RATTRAY (J. M.), & VAN WYK (G. F.). **The use of wraps containing o-phenylphenol for Citrus fruits.**—*J. Pomol.*, xviii, 2, pp. 135–144, 1940.

In experiments in South Africa with wraps impregnated with ortho-phenylphenol [*R.A.M.*, xix, p. 288], those containing 15 mg. of the preservative and 100 mg. of peanut [groundnut] oil per sq. ft. reduced the amount of *Penicillium digitatum* infection in two lots of commercially packed oranges stored for four weeks at 40° F. and then for 10 to 14 days at 65° from 5·34 and 6·63 per cent. in the controls (plain wraps) to 1·44 and 1·98 per cent. respectively; in Marsh grapefruit stored for four weeks at 60° from 2·12 to 0·89 per cent.; and in lemons stored for three weeks at 50° and one week at 65° from 11·44 to 1·09 per cent. With wraps containing only 5 mg. per sq. ft., the percentage of infected lemons was reduced from 4·31 to 1·90, and with wraps containing 9 mg. from 8·39 to 1·11 per cent. A gradual increase of the strength of the preservative from 0 to 24 mg. per sq. ft. was followed by a gradually increasing reduction in the amount of infected fruits. For practical purposes, however, the important point is that even with 9 mg., infection in lemons was reduced by about 87 per cent., the remaining decay being of no great commercial importance. It is considered doubtful, therefore, whether the potential extra reduction from a stronger preservative is worth striving for, since it would necessarily involve either greater risk of rind injury or the use of oil to obviate this risk.

The use of impregnated wraps containing 15 mg. ortho-phenylphenol and 100 mg. oil per sq. ft. reduced infection by *P. italicum* in oranges from 1·02 to 0·11 per cent. and wraps containing 8·7 mg. of the preservative per sq. ft. infection by *Trichoderma lignorum* [*T. viride*] in lemons from 5·8 to 0·2 per cent., preventing in the latter case the spread of the fungus by contact.

Oranges and grapefruit are rather more susceptible to injury by ortho-phenylphenol than lemons. With wraps containing 5 mg. per sq. ft. no injury was recorded in either of the three fruits but those containing 9 mg. caused an average of 8·9 per cent. injured fruits (of which 1·3 per cent. were severely injured) in oranges and 3·4 per cent. (mostly with quite inconspicuous injuries) in lemons; those containing 8 mg. caused 0·5 per cent. severely, and 3·5 per cent. mildly, injured fruits in grapefruit. The rind injury was effectively controlled by the use of glyceride oils. With 100 mg. groundnut oil up to about 15 mg. ortho-phenylphenol per sq. ft. can be fairly safely used for most lemons, but the amount tolerated by oranges is lower.

BLISS (D. E.). **The decline disease or Omphalia root rot of the Date Palm.**—*Rep. Date Grs' Inst., 1939*, pp. 7–8, [? 1939].

In experiments conducted in the Coachella Valley, California, under

orchard conditions, pure cultures of *Omphalia pigmentata* and *O. tralucida* [*R.A.M.*, xvii, p. 744] were inoculated into healthy five-year-old date palms and produced root-rot symptoms characteristic of the decline disease in eighteen varieties, including the Deglet Noor. The lesions were similar to those found in naturally infected palms, and the two fungi were reisolated from the necrotic tissues in every instance. The name 'decline disease' lacks precision and the author, following the suggestion of H. S. Fawcett, proposes the name '*Omphalia* root rot' for the disease of date palms caused by the two species of *Omphalia*.

WALLACE (G. B.). **Report of Plant Pathologist.**—*Rep. Coffee Res. Exp. Sta., Lyamungu, Moshi, 1938*, pp. 26–29, 1940.

Discussing the results of fungicide tests in the control of coffee leaf disease (*Hemileia vastatrix*) in Tanganyika described in the previous report [*R.A.M.*, xviii, p. 21], the author states that the crop was found to vary considerably from tree to tree, plot to plot, and also from year to year under any one treatment, so that crop counts would require to be taken over several years. The more promising method of taking records is to make monthly counts of fallen leaves from about 15 trees under each treatment. In the 1937 experiments the figures for leaf fall from August to December were: control 14,175, 1 per cent. Bordeaux 6,143, 0·5 per cent. Bordeaux 6,909, and copper hydroxide 12,616. Total leaf fall occurred earlier in the control and copper hydroxide plots than in either of the Bordeaux series. In the 1938 experiment the leaf fall figures were: controls 6,465 and 7,125; 1 per cent. Bordeaux 1,659, and cuprous oxide 3,827. Leaf fall did not occur earlier in the control plots in this experiment. Leaves formed after spraying appeared to be longer-lived and less diseased than those on untreated trees. The *Hemileia* infection in the experimental plots was so low that its control could not entirely explain the differences in leaf fall, and it is thought that the copper in the fungicides exercised a tonic effect on the plants.

Coffee trees growing on land with a western aspect were observed in February, during a very hot and dry season, to show die-back, 56 out of 389 trees being affected. The symptoms differed from those of normal die-back [ibid., xiii, p. 114] in first affecting the twigs at the nodes, one or both sides of which turn brown or black with dark brown lines on the wood below. The leaves at these parts also turn brown, hang down, and soon drop. When the disease has affected the entire twig, the distal parts wither and die. Several fungi were isolated from the diseased tissue, but none proved to be pathogenic in inoculation experiments. The disease is believed to be directly associated with intense sunshine during the early months of the year, and in some respects resembles 'Elgon die-back' described from Kenya [ibid., xviii, p. 438].

A visit to the Babati and Oldeani districts revealed the presence there of the following coffee diseases: *H. vastatrix* occurs on some plantations; *Cercospora coffeicola* [loc. cit.] and a yellowing of the leaves, both rather common, appear to be associated with cold winds at the higher elevations and may be controlled to some extent by the provision of windbreaks.

ARMSTRONG (G. M.), MACLACHLAN (J. D.), & WEINDLING (R.). **Variation in pathogenicity and cultural characteristics of the Cotton-wilt organism, Fusarium vasinfectum.**—*Phytopathology*, xxx, 6, pp. 515–520, 1 fig., 1 graph, 1940.

Thirteen monospore cultures of *Fusarium vasinfectum*, the agent of cotton wilt, grown on potato dextrose agar at 28° C. at the South Carolina Agricultural Experiment Station in 1937, gave rise after varying periods to variants generally characterized by sparser aerial mycelium and a slower growth rate than the parent strains. No case of reversion to the parental type was observed during 17 successive transfers, and in fact the mutants, which in their turn may produce secondary variants, tended to predominate over the parents, even to the exclusion of the latter.

In soil inoculation experiments with 14 isolates of *F. vasinfectum*, of which four were variants, pathogenicity was to some extent correlated with profuse mycelial development and rapid growth, while lengthy maintenance in culture (for up to six years) caused a reduction of virulence. Two of the four saltants included in the trials were markedly less virulent than their parents, the others not deviating so sharply from the type. A much higher degree of resistance was shown by the Dixie Triumph 12, Super Seven, and Semiwilt varieties than by Farm Relief 2, but the fungus was reisolated from a large number of plants showing neither internal nor external symptoms of infection. It is considered possible that variants of *F. vasinfectum*, differing in pathogenicity to cotton, may occur in the field.

WATKINS (G. M.) & WATKINS (MATILDE O.). **Experimental Phymatotrichum root rot of Retama and Corn.**—*Bull. Torrey bot. Cl.*, lxvii, 6, pp. 489–501, 27 figs., 1940.

In further studies on the cotton root rot fungus, *Phymatotrichum omnivorum* [*R.A.M.*, xix, p. 147], retama (*Parkinsonia aculeata*) and maize plants, which are considered immune from the disease at maturity under field conditions, were successfully inoculated with pure cultures of the organism in the seedling stage *in vitro*. A histological examination of infected plants showed that the process of infection is closely similar in both species. The cells of the host plant, from the epidermis inward, collapse and disintegrate, the cell walls becoming very thick and distorted in advance of the actual penetration by hyphae. Concurrently with this process individual hyphal tips may enter the lumina of cells of which walls have begun to break down, this being more often observed in maize than in retama. In the advanced stage the vascular cylinder is permeated with the mycelium. In the early stages of infection the nuclei and cytoplasm remain normal for a longer time than has been observed in cotton plants, but there was no evidence of the formation of special structures or tissues to inhibit invasion by the mycelium.

GREATHOUSE (G. A.) & RIGLER (N. E.). **The chemistry of resistance of plants to Phymatotrichum root rot. V. Influence of alkaloids on growth of fungi.**—*Phytopathology*, xxx, 6, pp. 475–485, 1940.

Continuing their studies at the Texas Agricultural Experiment Station on the chemistry of resistance to *Phymatotrichum omnivorum* in

plants [*R.A.M.*, xix, p. 470], the writers tested the influence on the growth of the fungus of 62 different alkaloids from 50 to 70 species belonging to 15 families varying in their reactions to the pathogen. Sanguinarine was found to be the most toxic of the substances investigated, completely inhibiting the development of *P. omnivorum* on a synthetic nutrient solution at a concentration of 2·5 p.p.m., followed by chelerythine, lycorine, oxyacanthine, delphinine, berbamine, and berberine [ibid., xix, p. 518] in the other named. In similar tests with six alkaloids on *P. omnivorum*, *Sclerotium rolfsii*, *Ophiobolus graminis*, *Armillaria mellea*, *Rhizoctonia* [*Corticium*] *solani*, *Fusarium vasinfectum*, and *Verticillium albo-atrum* it was found that the fungi showed increasing ability to tolerate alkaloids, usually in the order given, whilst the order of decreasing potency was as follows: sanguinarine, delphinine, berberine, gramine and solanine, and veratrine.

Generally speaking, the relative toxicity of the alkaloids to *P. omnivorum* corresponds with the relative rating for resistance of the plants from which they were isolated, indicating that their presence in the roots constitutes an important factor in ability to withstand infection.

STEINHAUS (E. A.). **The microbiology of insects with special reference to the biologic relationships between bacteria and insects.**—*Bact. Rev.*, iv, 1, pp. 17–57, 1940.

This is a comprehensive review, followed by a ten-page bibliography, of outstanding contributions to various aspects of the microbiology of insects, including the fungal flora of the intestinal tract, yeasts and moulds as food [cf. *R.A.M.*, xix, pp. 405, 471, *et passim*] and as enzyme-producing auxiliaries in the digestive process, and the nature, function, and transmissibility of intracellular micro-organisms (mycetomata) [ibid., xiv, p. 306].

DRECHSLER (C.). **Three fungi destructive to free-living terricolous Nematodes.**—*J. Wash. Acad. Sci.*, xxx, 6, pp. 240–254, 3 figs., 1940.

Continuing his studies on the fungal parasites of nematodes in decayed plant remains and leaf mould in the United States [*R.A.M.*, xviii, p. 798; cf. also xix, p. 472], the writer fully describes [with Latin and English diagnoses] two new monotypic genera, of which the type species are *Haptoglossa heterospora* and *Meristacrum asterospermum*, as well as a feebly predaceous undetermined species of *Cephalosporium*.

SMITH (C. E.). **Epidemiology of acute coccidioidomycosis with erythema nodosum ('San Joaquin' or 'Valley fever').**—*Amer. J. publ. Hlth*, xxx, 6, pp. 600–611, 3 graphs, 1 map, 1940.

This is a useful survey of the information available to date concerning the following aspects, among others, of the benign 'San Joaquin' or 'Valley fever' or 'desert rheumatism' (*Coccidioides immitis*) in California [*R.A.M.*, xix, p. 537]: incubation period, source and mode of transmission, seasonal distribution, and extent of coccidioidomycosis. The endosporulating spherules of the fungus do not appear to pass directly from host to host, infection being acquired through inhalation of the chlamydospores.

Stewart (R. A.) & Kimura (Frances). **Studies in the skin test for coccidioidal infection. I. The preparation and standardization of coccidioidin.**—*J. infect. Dis.*, lxvi, 3, pp. 212–217, 1940.

A simple method for the preparation of coccidioidin is described and a table given showing the results of skin tests on four patients suffering from infection by *Coccidioides immitis* [*R.A.M.*, xix, p. 153 and preceding and next abstracts]. Doubts are expressed concerning the adequacy of the generic concept of *Coccidioides* and the specific name of *immitis*: it is quite possible that more than one species of the fungus is concerned in the immunological problem.

Hansel (F. K.). **Hay fever. The value of daily atmospheric counts of pollen grains and mould spores in diagnosis and treatment.**—*J. Mo. med. Ass.*, xxxvii, 6, pp. 241–246, 3 graphs, 1940.

The following fungi are stated to be of primary importance as incitants of allergy in persons liable to hay fever in the St. Louis district of Missouri [cf. *R.A.M.*, xix, p. 473]: *Alternaria, Hormodendrum* or *Cladosporium*, *Helminthosporium*, [unspecified] rusts and smuts, *Aspergillus fumigatus*, *Cephalothecium* [*Trichothecium*] *roseum, Mucor, Penicillium rubrum*, and *Monilia sitophila* [ibid., xix, p. 152]. Daily atmospheric counts of ragweed (*Ambrosia* spp.) and other pollens and of these fungal spores are of indispensable value in the diagnosis and treatment of the disorder during the hay fever seasons, of which there are three in the locality under observation. Among 194 patients tested by C. H. Eyermann (personal communication) for mould sensitivity, 21 per cent. gave positive reactions. Thirty-five per cent. of hay fever patients reacted positively to moulds (mostly *Alternaria*).

Vaughan (J. B.) & de Kay (H. G.). **A study of athlete's foot and its control.**—*J. Amer. pharm. Ass.*, xxix, 6, pp. 260–263, 2 graphs, 1940.

With a view to arresting the spread of 'athlete's foot' (*Trichophyton rosaceum*) [*R.A.M.*, xviii, p. 178; xix, p. 216] in the gymnasia and swimming pools of Purdue University, Indiana, the authors carried out a series of laboratory experiments to determine the toxicity to cultures of the fungus on Sabouraud's medium of various chemical compounds, of which sodium hypochlorite [ibid., xii, p. 509] gave the best results, inhibiting growth in 20 seconds at concentrations ranging from 0·1123 to 0·9512 per cent. The introduction of 13 gals. of 1 per cent. (available chlorine) of the disinfectant into foot baths with a capacity of 25 gals. proved very satisfactory as a prophylactic.

Lewis (G. M.) & Hopper (Mary E.). **Cultural variations of Trichophyton purpureum (Bang), with a discussion of the recognizable features.**—*Arch. Derm. Syph., Chicago*, xli, 5, pp. 895–903, 6 figs., 1940.

From studies extending over a three-year period in New York on more than 200 freshly isolated strains of *Trichophyton purpureum* [*R.A.M.*, xix, p. 473] on three different synthetic agar media (containing dextrose or maltose and peptone), the writers conclude that the apparent cultural differences do not invalidate the uniformity of the

species as a whole. Sectors developed in five of the strains under observation. Microconidia (predominating in fluffy colonies) are produced in or along the mycelium as sporiferous hyphae. Fuseaux are abundant in granular colonies. A reduction in the nutrient content of the medium results in the development of racquet mycelium and chlamydospores.

T. purpureum Bang (with which *Epidermophyton rubrum* Cast., *T. rubidum* Priestley, *T.* A. and B. Hodges, *T. purpureum* Ota, *Sabouraudites rubra* Ota & Langeron, and *T. plurizoniforme* are regarded as synonymous) is placed, on the basis of clinical investigations on five cases of folliculitis, in the ectothrix group.

AGRESS (H.) & GRAY (S. H.). **Histoplasmosis and reticuloendothelial hyperplasia.**—*Amer. J. Dis. Child.*, lvii, 3, pp. 573–589, 6 figs., 1939.

This detailed record of a generalized case of histoplasmosis (*Histoplasma capsulatum*) [*R.A.M.*, xix, p. 557] in a seven-months-old male infant at the Jewish Hospital, St. Louis, Missouri, is accompanied by three tables summarizing (1) clinical, (2) gross pathologic, and (3) microscopic observations in seven (including the present) well-attested reports of the disease.

CLEMENS (H. H.) & BARNES (M. L.). **Histoplasmosis of Darling: report of a case.**—*Sth. med. J.* (*J. sth. med. Ass.*), xxxiii, 1, pp. 11–15, 8 figs., 1940.

Histoplasma capsulatum [see preceding and next abstracts] was isolated immediately after autopsy from the spleen of a 33-year-old coloured woman at the Louisville (Kentucky) City Hospital in the form of Gram-negative, yeast-like elements surrounded by thick, colourless capsules, 1·5 to 4 μ in diameter, and grown on 5 per cent. rabbit blood agar, on which a fine growth of small, grey, lustreless, confluent colonies began to develop after four days.

WILLIAMS (R. H.) & CROMARTIE (W. J.). **Histoplasmosis: report of a case.**—*Ann. intern. Med.*, N.S., xiii, 11, pp. 2166–2171, 1940.

The writers describe a case of histoplasmosis (*Histoplasma capsulatum*) [see preceding abstracts] associated with chronic lymphatic leucaemia in a 56-year-old farmer in Tennessee. The pathogen was present in many lymph nodes and also in the pharynx and epiglottis, the two latter being new sites of infection. The nodes were occupied by areas consisting of large, mononuclear cells which contained numerous small, oval or circular bodies, 0·5 to 2 μ in diameter, enveloped in refractile, non-staining capsules.

MICKLE (W. A.) & JONES (C. P.). **Dissociation of Candida albicans by lithium chloride and immune serum.**—*J. Bact.*, xxxix, 6, pp. 633–646, 3 pl., 1940.

Eighteen freshly isolated strains of *Candida albicans*, 14 from the vagina and 4 from the sputum, were cultured at the Duke University Hospital, North Carolina, at 37° C. on Sabouraud's broth containing 0·25 per cent. lithium chloride and five also on the same medium plus 3 per cent. immune rabbit serum to induce dissociative changes [*R.A.M.*,

xix, p. 344]. Transfers were made every 48 hours and Sabouraud's and blood agar streaked at each transfer until rough colonies appeared.

Dissociation occurred in 14 out of the 18 strains studied. Individual colonies on Sabouraud's agar plates were greyish-white, creamy, rounded up, and surrounded by regular margins. The rough forms were white, flat, dry, and somewhat larger than the smooth ones, with a general resemblance to *C. krusei*. On blood agar an intermediate type of colony was also distinguishable, white and creamy with stellate margins: on transference to Sabouraud's agar it produced a creamy growth identical with that of the smooth forms. On blood agar the rough colonies appeared as dull grey, thin, spreading growths with irregular borders, becoming detached from the surface of the medium on transference. In Sabouraud's broth the smooth forms produced a homogeneous sediment in the bottom of the tube, the supernatant fluid remaining relatively clear. On the other hand, the rough forms made only scanty growth in the bottom of the tube but developed a pronounced 'veil' similar to that formed by *C. krusei*, extending 5 to 6 mm. above the surface of the broth after 24 hours.

On Sabouraud's agar the smooth strains appeared as round or slightly oval budding cells, whereas the rough forms were elongated or assumed bizarre shapes, often suggestive of mycelial hyphae. Maize meal agar slide cultures of the smooth strains showed a well-developed mycelium with numerous chlamydospores, frequently in clusters, at the ends of the branches. The mycelium of the rough forms was brush-like, with groups of elongated blastospores and large numbers of filiform, septate hyphae, but no chlamydospores.

Both the smooth and rough forms produced acid and gas in glucose and maltose, acid only in sucrose, and failed to ferment lactose.

Intravenous injections of all the smooth strains were lethal to rabbits in two to five days, whereas the rough forms were nonpathogenic in doses ten times as large. Subcutaneous injections of suspension of the smooth forms induced localized abscesses with erythema and the formation of hard nodules in four days, while little or no reaction followed infection with the rough strains.

It is concluded that the variants under observation were true rough phases of *C. albicans* analogous to bacterial dissociants.

FOWLE (L. P.), LEGAULT (R. R.), HERITAGE (NAOMI), & DELLUVA (ADELAIDE M.). **Perianal moniliasis and associated pruritus ani cured by specific desensitization.**—*J. invest. Derm.*, iii, 3, pp. 193–203, 1940.

Full particulars are given of three cases of perianal moniliasis in male patients caused, respectively, by *Monilia* [*Candida*] *albicans*, *M.* [*C.*] *parapsilosis*, and *M.* [*C.*] *stellatoidea* [*R.A.M.*, xix, p. 535], and all responding favourably to specific desensitization with extracts of the fungi concerned (except that *C. albicans* was successfully substituted for *C. stellatoidea* in the third).

HOUSTON (B. R.). **Botrytis blight of Flax in California.**—*Plant Dis. Reptr*, xxiv, 11, pp. 213–214, 1940. [Mimeographed.]

On 3rd April, 1940, Punjab flax plants grown in Fresno County,

California, which had reached the growth stage when most of the capsules were about two-thirds of their mature size, were found to be infected by *Botrytis cinerea* [*R.A.M.*, xix, p. 21], not before recorded on this host in the United States. Many of the capsules showed blighting characterized by a light tan colour, infection frequently extending for several inches down the branch bearing the affected capsule. The main stems of several of the plants were girdled by brown lesions ranging from a fraction of an inch to several inches in length. The condition was most severe in fields planted very early. It appeared that the early-planted flax had blossomed towards the end of February, when there was an exceptionally prolonged period of dull, wet weather, while the later-planted fields were in bloom during a relatively dry spell. The losses in the early and late fields were from 10 to 25 per cent. and from a trace to 5 per cent., respectively. The evidence showed that infections originated in old petals.

MACKIE (W. W.). **Botrytis cinerea in California Flax fields.**—*Plant Dis. Reptr*, xxiv, 11, pp. 214–215, 1940. [Mimeographed.]

The outbreak of *Botrytis cinerea* on Punjab flax in Merced, Fresno, and Madera Counties, California, in April, 1940 [see preceding abstract], appeared to be favoured by morning fogs. The advent of a three-day period of north wind arrested the spread and progress of infection, but only after some fields had suffered estimated damage of 50 per cent. Growers stated that the disease appeared in 1938, when there was also a wet spring.

MOORE (W. C.). **New and interesting plant diseases.**—*Trans. Brit. mycol. Soc.*, xxiv, 1, pp. 59–63, 1 pl., 1940.

The following notes relate to material examined in 1939 at the Ministry of Agriculture's Plant Pathological Laboratory, Harpenden [cf. *R.A.M.*, xviii, p. 400]. A severely diseased plant of *Lobelia syphilitica* var. *nana* from a Maidenhead nursery bore irregular, pallid spots, spreading inwards from the leaf margins or tips and surrounded by fairly broad, indefinite, pink to mauve-pink borders. Numerous black, ostiolate pycnidia of a *Septoria* apparently identical with *S. lobeliae* Peck, 75 to 105 μ in diameter, were scattered in small groups over the affected leaves, many of which had been killed; the pycnospores were filiform, straight to slightly curved, with rounded ends, 18 to 30 by 1 to 1·5 μ (average length 23 μ).

Campanula raineri in the same nursery was also attacked by a species of *S.* causing a brown, coalescent blotching of the leaves, which were destroyed. The affected areas bore numbers of scattered or aggregated black pycnidia, 60 to 105 μ in diameter, with a well-marked ostiole up to 24 μ across, containing straight to more or less curved, hyaline, non- to triseptate spores with rounded ends, 17 to 38 by 1·5 to 3 μ (average length 27 μ). The species with which the foregoing appears to agree most closely is *S. obscura* Trail, found on living *C. rotundifolia* leaves in Great Britain in 1889.

Dead stems, petioles, leaves, and flowers of *C. betulaefolia* and leaves of *C. raineri* were found to be invaded by *Ascochyta bohemica* Kab. & Bub., not hitherto known in Great Britain. The hyaline, continuous to

uniseptate, uni- to pluriguttulate pycnospores measured 12 to 21 by 4 to 6 μ (average length 18 to 19 μ).

Since the first report on the *Pythium* rot of forced tulips [ibid., xvii, p. 246] the disease has been observed under glass on the varieties Prof. Rauwenhof (Hants, 1938), Allard Pierson (Lincs., 1938), and William Copland (Middlesex, 1939). The importance of a high soil moisture content in the development of infection was demonstrated by observations in a large Essex nursery, in which some 60,000 boxes of commercial varieties, practically waterlogged by heavy autumn rains, showed typical symptoms of the disease in many of the plants. Infection was arrested by the removal of the boxes indoors and the provision of dry conditions. Severely infected bulbs were brown, soft, and rubbery, or reduced to a shiny, dirty yellow mass. In milder cases the internal parts were white and sound, while the outer fleshy scales were wet, soft, sticky, of a dull white or pale yellow-brown colour, a well-marked, yellow or brown line frequently marking the division between the healthy and diseased areas. In slight attacks the basal plate and young bud within the bulb were partly or completely rotted. *Penicillium* and *Fusarium* spp. were sometimes found in profusion on the outer scales in the later stages of decay, but *Pythium* was the only constant concomitant of the rot. Of the two strains isolated in pure culture one exhibited the typical features of *P. ultimum*, while the other produced no fructifications and therefore could not be identified, though it resembled the form previously observed in England under glass [loc. cit.], its conidia being slightly smaller (average 21 to 28 μ in diameter) than those of *P. ultimum*. Inoculations with one or other of these two strains on 12 wounded Prince of Orange bulbs resulted in the development of typical symptoms on all in a moist atmosphere at 22° C.; under dry conditions at 7° to 14° only 4 out of 10 became diseased, three slightly. Infection was rapidly checked in mild or moderate cases by placing the bulbs in cool, airy sheds, but the outer scales, and sometimes the interior also, assumed a chalky aspect characteristic of the final stage in a series of changes induced by various parasitic or physiological factors [ibid., xix, p. 153] and once before, in 1938, observed in the same nursery in association with *Pythium*.

HONEY (E. E.). **Monilinia causing a brown rot and blight of the common Azalea.**—*Phytopathology*, xxx, 6, pp. 537–538, 1940.

Latin and English diagnoses are given of *Monilinia azaleae* n.sp., a parasite of the common azalea (*Rhododendron roseum*) in central New York [*R.A.M.*, xv, p. 531] and of *R. canescens* (collected by J. Miller) in Georgia. The stipitate cyathoid to patelliform apothecia, with a cinnamon-brown through Prout's brown to brown-black disk, attain 0·83 to 3·5 cm. in height at maturity and arise singly or in couples from the outer surface of the pseudosclerotium in mummified capsules; the smooth, slender, cylindrical stipe measures 0·4 to 3 cm. by 0·5 to 2 mm., and from its basal portion a conspicuous, blackish, capilliform rhizoidal tuft radiates fanwise; the expanding disk becomes cyathoid, later infundibuliform, and ultimately patelliform, 0·2 to 1·4 cm. in diameter; the cylindrical to clavate asci, 178 to 258 by 11 to 16·5 (average 213 by 13·8) μ, contain eight hyaline, elliptical spores, 9 to 20 by 5 to 14 (13·9

by 9·5) μ, usually arranged obliquely and biseriately in the upper end of the ascus; the numerous filiform, hyaline, non- to biseptate paraphyses, are about the same length as the asci; the continuous, limoniform, hyaline conidia, 8·5 to 19 by 5·5 to 14·5 (12·4 by 9·6) μ, are borne in long, di- and trichotomously branched chains and are separated at maturity by small, fusiform disjunctors. Pseudosclerotia develop in the infected capsules, filling the loculi with a solid mass of thick-walled, hyaline hyphae, assuming a palisade-like arrangement at the point of contact with the wall of the pericarp and the dissepiments. Capsules containing pseudosclerotia do not open but fall to the ground, where they over-winter in the leaf mould under the shrubs and may give rise in the following late April or early May to the apothecial stage. The conidia attack the leaves and succulent shoots when the host is in full bloom in early June, and are common on the young capsules later in the same month and in July.

BIRAGHI (A.). **Osservazioni e considerazioni su 'Tuberculina sbrozzii' Cav. et Sacc. associata a 'Puccinia vincae' Berk.**—[Observations and considerations on *Tuberculina sbrozzii* Cav. & Sacc. associated with *Puccinia vincae* Berk.]—*Boll. Staz. Pat. veg. Roma*, N.S., xx, 1, pp. 71–80, 5 figs., 1940.

In the spring of 1938 the author observed periwinkle [*Vinca*] leaves infected by *Puccinia vincae* [*R.A.M.*, ix, p. 602] and also showing the presence of the conidia and sporodochia of *Tuberculina sbrozzii*. Two years' observations showed that the pycnidia of *P. vincae* alone appeared first, next sporodochia of *T. sbrozzii*, and later on, as these fructifications ceased, immature uredosori and teleutosori. As the uredospores and teleutospores appeared, conidial production by *T. sbrozzii* declined, and in time fructifications of this fungus became very difficult to find. The evidence is considered to indicate that *T. sbrozzii* is a true parasite of the periwinkle and not of *P. vincae*, though probably needing the presence of the latter for its development.

DAVIS (W. H.). **New stages of Sporocybe azaleae.**—*Phytopathology*, xxx, 6, pp. 506–514, 1 pl., 1 fig., 1940.

In further studies at the Massachusetts State College on the life-history of *Sporocybe azaleae*, the agent of *Rhododendron* bud and twig blight [*R.A.M.*, xviii, p. 682], the fungus, which was cultured on potato dextrose agar and other media at 22° C., was found to pass through the mycelial, chlamydosporous, cephalosporous, penicilloid, and coremial stages, and probably the ascogenous also.

Hyaline to grey phialides, 12 to 30 by 2·5 and 1·7 μ at the base and apex, respectively, arising singly and vertically from horizontal, prostrate hyphae, bore at the apices only oblong to angular, hyaline to brown- or grey-tinted cephalospores, 5·1 to 9 by 2·5 to 4·2 (mean 5·5 by 3·5) μ, cohering to form a 'caput' or 'false head', 20 μ in diameter, but ultimately separating. Dark brown, penicilloid conidiophores, 60 by 3 to 6 μ, terminated in a dendritic 'caput' of 2 to 12 spreading, dichotomous branches each supporting an apical chain of unicellular, ovate to globose or slightly apiculate, brown conidia, 2·8 to 9 by 1·5 to 5 μ; this stage develops in cultures following the cephalospores and in nature on

decaying buds, flowers, and branches. The coremial stage mostly occurs on the infected terminal buds of the previous season or earlier and consists of a sepia synnema or stipe, 480 by 50 μ, originating from a sclerotium and consisting of parallel hyphae or conidiophores, entirely similar to those of the penicilloid stage, the free ends of which form a 'caput' measuring 106 μ in height and 188 μ in expanded width; the globose to ovate, ellipsoid, or oblong, dark brown to sepia coremiospores, 3 to 17 by 3 to 10 (mean 7·2 by 5·4) μ, are formed in chains of up to 9 at the tips of conidiophores in the 'caput'. The perithecia average 394·8 by 310·8 μ and are furnished with beaks 902·4 by 67 μ; these appendages, more than twice the height of the body, recall the similar structures in *Ceratostomella ulmi*, a relationship between which and *S. azaleae* has previously been suggested [loc. cit.]. The few ascospores contained in one of the perithecia measured 3·6 to 9 by 1·8 to 3·6 μ.

JONES (L. K.). **Fusarium leaf spot of Sansevieria.**—*Phytopathology*, xxx, 6, pp. 527–530, 2 figs., 1940.

Sansevieria zeylanica and its var. *laurentii*, growing under glass in the State of Washington, are subject to infection by *Fusarium moniliforme* [*Gibberella fujikuroi*], which was isolated on potato dextrose agar from the sunken, reddish-brown, yellow-bordered, roughly circular lesions, ½ to 1 cm. in diameter, on the leaves [*R.A.M.*, xvi, p. 537]; in some cases only one surface is involved, but in others the spots extend right through the leaf, and the centre shrivels and falls out. In inoculation experiments on *Sansevieria*, typical symptoms were produced by *G. fujikuroi* on both wounded and sound leaves. Spraying with 4–6–50 Burgundy mixture plus 0·5 per cent. penetrol [ibid., xvii, pp. 123, 685] gave good coverage and did not injure the host. Plant sanitation practices should aid in reducing infection.

FISCHER (G. W.). **Two cases of haplo-lethal deficiency in Ustilago bullata operative against saprophytism.**—*Mycologia*, xxxii, 3, pp. 275–289, 4 figs., 1940.

Five collections of *Ustilago bullata* [*R.A.M.*, xviii, p. 441] on *Agropyron*, *Bromus*, *Elymus*, and *Festuca* spp. showed a haplo-lethal deficiency inhibiting saprophytic existence. About half the spores isolated from any promycelium developed into typical sporidial colonies, the remainder budding several times and then undergoing complete lysis. In four collections the lethal factor was sex-linked, 42 pedigreed monosporidial isolates being of the same sex phase. In the fifth collection the lethal factor was segregated independently of sex factors, both sexes being represented in the isolates not possessing the character.

Twenty-nine pedigreed monosporidial isolates of the five collections exhibiting the lethal factor were paired with 22 isolates from *U. nigra*, *U. bullata*, *U. hordei*, *U. levis*, and *U. avenae* not possessing it. Both sexes were equally represented in the 22 isolates, and when paired with these the 29 isolates (all but two of which were of the same sex) gave the same reaction as when paired with each other. Thus, from the four collections in which the lethal factor was sex-linked, the 23 isolates obtained were of the same sex, both when mated with each other and

with the 22 isolates of *U. bullata* and other species not possessing the lethal factor.

The haplo-lethal factors operate only against saprophytic growth. When chlamydospores of two of the collections possessing sex-linked haplo-lethal deficiency were used as inoculum, high percentages of infection resulted, showing that the lethal factor did not operate against infection; from data as yet unpublished the author considers that both sexes are necessary to infection.

The lethals being exhibited by about half the sporidia borne on any promycelium, they are probably borne on odd chromosomes, in four instances sex-linked and in one other case apparently independent of sex.

SPRAGUE (R.). **Notes on Septoria scald of Vetch and Peas in Oregon.**—*Phytopathology*, xxx, 6, pp. 541–542, 1 fig., 1940.

Vetch (especially *Vicia sativa*) is stated to be subject to severe damage in Oregon from a stem rot or scald and leaf spot due to *Septoria viciae* West., which causes a purple to vinaceous cortical rot of the lower culm. Spotting and speckling extend up the stem and into the leaves, and after the late winter rains the lesions coalesce into large scorched areas, involving severe injury and reduction of seed yield. Infection is disseminated by means of rain-splashed pycnospores, which are of two types, macrospores (53 to 71 by 1·7 to 2·1 μ) and microspores (3·5 to 11 by 1·2 to 1·5 μ), the former being straight to curved or slightly sinuous, broadly filiform, mostly triseptate, with small oil drops in the cells, and the latter non-septate and bacillar-shaped. The Hungarian vetch [*V. pannonica*] is less susceptible than *V. sativa*. Austrian field peas in the same State also suffer severely from a cortical stem scald produced by *S. pisi*.

CROSIER (W.) & WEIMER (DOLORES). **Some fungi associated with grass seed.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1939*, pp. 120–124, 3 figs., 1940.

The following fungi are listed in the descending order of their importance as occurring on seeds of grasses at Geneva, New York (the pure cultures being identified by J. E. Machacek of the Dominion Laboratory of Plant Pathology, Winnipeg, Manitoba): *Curvularia spicifera* [*R.A.M.*, xvi, p. 735], *Alternaria tenuis*, *Helminthosporium sativum*, *Fusarium moniliforme* [*Gibberella fujikuroi*], *F. culmorum*, *Epicoccum purpurascens*, and *Phoma glomerata* [ibid., xvi, p. 106]. The two last-named were found only on the glumes of ungerminated seeds and do not apparently infect normal seedlings. *A. tenuis* and *C. spicifera* are saprophytes occurring on many seeds, but usually not parasitic on growing plants. Seedlings of *Poa* spp., however, may be killed by the first-named fungus and sprouts of rough bluegrass [*P. trivialis*] and Canada bluegrass [*P. compressa*] by either of the two. Following seedling inoculation by atomizing spores over the plumules, *A. tenuis* was slightly pathogenic to seedlings of red fescue [*Festuca rubra*] and Kentucky bluegrass [*P. pratensis*], but not of redtop [*Agrostis palustris*], and *C. spicifera* to those of *P. pratensis* and *A. palustris* but not of *F. rubra*. *Fusarium culmorum* killed 20 per cent. of the seedlings in *F. rubra* but seemed not to infect

P. pratensis and *A. palustris*. *H. sativum* was very pathogenic to these three and a large number of other grasses.

CHILTON (S. J. P.). **The occurrence of Helminthosporium turcicum in the seed and glumes of Sudan Grass.**—*Phytopathology*, xxx, 6, pp. 533–536, 1 fig., 1940.

Out of 52 lots of Sudan grass (*Sorghum vulgare* var. *sudanense*) [*S. sudanense*] seed produced in ten States between 1936 and 1939, 21 (40 per cent.) were found at the United States Regional Pasture Research Laboratory, State College, Pennsylvania, to be infected by *Helminthosporium turcicum*, which occurred in the seed and glumes of 16 lots, in the former alone of two, and in the latter alone of three, the percentage of diseased seed and glumes ranging from 1 to 20 and 1 to over 50, respectively. Four out of the five seed lots produced in 1937 were infected (8 per cent. seed and 3 per cent. glumes) indicating that the pathogen can survive in stored material for two winters. One hour's. sterilization of the seed in 1 in 1,000 mercuric chloride, preceded by a one-minute dip in 95 per cent. ethyl alcohol and followed by immersion in a saturated solution of sodium hypochlorite, reduced germination from 90·4 to 87·9 per cent. and the incidence of *H. turcicum* from 15·2 to 2·7 per cent., the corresponding figures for a three-hour treatment being 72·7 and 1·2 per cent., respectively, denoting that the organism is practically confined to the seed coat. The average germination percentages of 22 healthy and 13 infected seed lots were 83·5 and 75·5, respectively.

Other fungi isolated from *S. sudanense* seed included species of *Alternaria*, *Helminthosporium*, *Acrothecium*, *Oospora*, *Penicillium*, *Fusarium*, *Chaetomium*, and *Phoma*, the first-named being found in 70 per cent. of the seeds and 50 per cent. of the glumes in some lots. *Colletotrichum graminicola* was an occasional occupant of several lots and was present in over 50 per cent. of the seeds and glumes of one batch from Georgia.

WORMALD (H.). **Host plants of the brown rot fungi of Britain.**—*Trans. Brit. mycol. Soc.*, xxiv, 1, pp. 20–28, 2 pl., 1940.

Blossom wilt of fruit trees and ornamental shrubs of *Pyrus* and *Prunus* in the British Isles is stated to be caused by *Sclerotia laxa* (*Monilia cinerea*), and brown rot of pome and stone fruits and flowering shrubs by *S.* (*M.*) *fructigena* [*R.A.M.*, xiv, p. 367 *et passim*], the latter occurring exclusively in its imperfect phase while the ascigerous stage of the former has only once been observed. The use of the generic name *Monilia* in preference to *Sclerotinia* will thus be more readily intelligible [ibid., xix, p. 480].

M. cinerea f. *mali* [*S. laxa* f. *mali*] is a common and destructive agent of blossom wilt on apples, pears being less frequently affected by [*S. laxa*: ibid., x, p. 322; xiii, p. 33], which has only rarely been found on apple, pear, quince, and medlar fruits. *S. fructigena* is common on apple, pear, and quince and has been found in recent years to be generally more prevalent than *S. laxa* on stone fruits (plums [ibid., xvi, p. 759] and Morello cherries). Plums of the St. Julien and Black Bullace varieties appear to be particularly susceptible to *S. fructigena*, which also attacks the stored fruit [loc. cit.]; in 1939 only four out of over 70 diseased

Shepherd's Bullace fruits on a tree at the East Malling Research Station bore *S. laxa*, the rest being invaded by *S. fructigena*. Both species occur on peach and nectarine, but no definitive estimate of their relative prevalence on these fruits has yet been made.

Other hosts of *S. laxa* in England include *P. serrulata*, *P. tomentosa*, *P. pumila*, bird cherry (*P. padus*), almond, Dwarf Russian almond (*P. nana*), *Pyrus purpurea* [ibid., xv, p. 703], *P. elaeagnifolia*, *P. aria*, and *P. japonica*. Cross-inoculation experiments with *S. fructigena* from quince, apple, and plum gave positive results on apple, plum (Shepherd's Bullace), and apple and pear, respectively, while *S. laxa* from pear spurs infected apple flowers and plum fruits, and was also successfully conveyed from medlar leaves to apple flowers, from plum twigs to pear flowers, from plum and cherry fruits to Morello cherry flowers, from cherry fruits to pear, flowers producing typical blossom wilt in all cases, from apricot twigs to cherry fruit and flowers, from *P. tomentosa* twigs to apple, pear, and cherry fruits, from *P. japonica* twigs to apple, pear, and cherry fruits, and from *P. purpurea* twigs to plum fruits, with rapid brown rot of the fruit in every instance. Although corresponding cross-inoculation tests from fruit trees to flowering shrubs have not yet been carried out, it may be assumed that the presence of *S. laxa* on the former involves a risk of damage to the latter in gardens where they are cultivated for ornamental purposes.

McLarty (H. R.). **British Columbia uses boron for fruit.**—*Bett. Crops Pl. Food*, xxiv, 4, pp. 8–11, 37–38, 1940. [Abs. in *Chem. Abstr.*, xxxiv, 13, p. 4509, 1940.]

Manifestations of boron deficiency in apples may take the form of corky core [see next abstracts], drought spot [*R.A.M.*, xiv, p. 592], flat fruit, measles [ibid., xix, p. 352], or die-back; in pears and cherries of drought spot or die-back; and in peaches, plums, and prunes of die-back, all the disorders in question being aggravated by the excessive use of nitrogenous fertilizers. Four years after the application of boric acid to the soil a slight recurrence of the various troubles may be expected, necessitating a repetition of the treatment.

Magness (J. R.). **Control of internal cork of Apples by boron applications.**—*Penn. hort. Ass. News*, xvii, pp. 74–75, 77–80, 82, 1940. [Abs. in *Chem. Abstr.*, xxxiv, 13, p. 4511, 1940.]

Virtually complete protection against internal cork of apples [see preceding and next abstracts] was conferred for a minimum period of three years by the application to the soil surrounding 20-year-old trees of 1 lb. boric acid or $\frac{3}{4}$ lb. borax. In the eastern States, the McIntosh, Cortland, and Ben Davis varieties, followed by Rome Beauty and Jonathan, appear to suffer most severely from the disease, which tends to be more widespread in years of intense drought than in those with a normal rainfall. Under conditions of extreme boron deficiency, 'surface drought spot', a superficial discoloration of the fruit, may occur six to eight weeks after blossoming, and die-back of the terminal branches may also be observed.

CHITTENDEN (E.) & THOMSON (R. H. K.). **The effect of borax on the storage quality of Jonathan Apples.**—*N.Z. J. Sci. Tech.*, A, xxi, 6, pp. 353–356, 1940.

Previous investigations having shown that heavy top-dressings of borax adversely affected the keeping quality of Jonathan apples [*R.A.M.*, xvii, p. 462], further observations were made at the Cawthron Institute, Nelson, New Zealand, to determine the duration of these effects. The amounts of internal breakdown in the 1937–8 season after nine months in storage at 38° F. for the ½, 1, and 3 lb. per tree applications were 13, 16, and 56 per cent., respectively, compared with 4 per cent. for the controls, the corresponding figures for 1936–7 being 35, 57, 81, and 11, respectively. The incidence of fungal rots [unspecified] for the three borax treatments and controls in 1937–8 was 4, 4, 22, and 3 per cent., respectively, as against 6, 23, 41, and 1, respectively, in 1936–7. Analyses of the boron content of 1937–8 samples of the experimental fruit revealed the presence of 28, 42, 78, and 20 p.p. million for the ½, 1, and 3 lb. treatments and controls, respectively, correlated with breakdown percentages of 6, 9, 40, and 2 per cent., respectively, the corresponding figures for 1936–7 being 30, 80, 111, and 17 p.p. million and 21, 45, 71, and 7 per cent., respectively. Fungal rots in the three treated lots and controls in 1937–8 amounted to 4, 4, 22, and 3 per cent., respectively, compared with 6, 23, 41, and 1 per cent., respectively, in 1936–7.

In another series of experiments in two localities, factors other than boron content apparently played a decisive part in the development of breakdown in stored Jonathans, no deleterious effect on which, however, was exerted by the 0·10 and 0·25 per cent. borax sprays recently found to be helpful in the control of internal cork [ibid., xix, p. 416].

WALLACE (T.) & JONES (J. O.). **Pot experiments on bitter pit of Apples.**—*Rep. agric. hort. Res. Sta. Bristol, 1939*, pp. 79–84, [1940].

Injection experiments with the salts of major and minor elements and citric acid on Bramley's Seedling apple trees growing in compost in pots showed that none of the treatments gave satisfactory control of bitter pit. Appreciable damage to the trees was caused by cobalt and nickel. In field tests boric acid and iron citrate failed to control bitter pit in apples and cork in pears [*R.A.M.*, xviii, p. 118].

WALLACE (T.) & JONES (J. O.). **Boron in relation to bitter pit in Apples.**—*J. Pomol.*, xviii, 2, pp. 161–176, 1940.

The results of storage tests and chemical studies carried out at Long Ashton and in various orchards during 1935 and 1936 with apples of several varieties (mainly Bramley's Seedling) led to the conclusion that boron is not related to the bitter pit problem in England [see preceding abstract].

KIDSON (E. B.), ASKEW (H. O.), & CHITTENDEN (E.). **Magnesium deficiency of Apples in the Nelson district, New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxi, 6, pp. 305–318, 4 figs., 1 graph, 1940.

Premature defoliation of Jonathan, Sturmer, and Cox's Orange apple

trees in the Nelson district of New Zealand has been identified as the final expression of magnesium deficiency [*R.A.M.*, xix, p. 545], earlier symptoms of which include a purplish or dark brown interveinal discoloration of the leaves, proceeding upwards from the base of the current season's leader growth and leaving only a tuft of green foliage at the tip. The Dunn's Favourite and Granny Smith varieties first develop chlorosis of the type ordinarily associated with magnesium deficiency in crop plants, necrotic areas later appearing between the veins.

The injection of 0·25 per cent. magnesium sulphate into the branches of affected trees gave excellent control of the trouble, slightly less satisfactory results being obtained with a mixture of this compound and calcium nitrate, while calcium acetate alone caused severe scorching. Analyses of leaf samples from injected Jonathan trees revealed a large increase in the magnesium content of the foliage, e.g., from 0·37 and 0·16 per cent., respectively, in the leader tip and older leader leaves to 0·63 and 0·48, respectively. A good correlation was established between leaf blotching and a low magnesium content of the foliage, severe symptoms occurring, for instance, in the presence of 0·37 and 0·16 per cent. of the element in the leader tip and older leaves, respectively, but not in that of 0·54 and 0·25 per cent., respectively.

Premature defoliation of apple trees was found to be most prevalent in conjunction with a liberal use of potassic fertilizers, high potash figures coinciding with a low magnesium content in leaf analyses, e.g., 1·72 and 2·21 per cent. potash and 0·37 and 0·16 per cent. magnesium in the leader tip and older leaves, respectively, of badly blotched trees. It is considered probable that heavy applications of potash manures on several acid leached soils of the Nelson district has induced an unfavourable ratio of available potassium to available magnesium in the soil, thereby reducing the intake of the latter by the trees.

[An account of this work also appears in *J. Pomol.*, xviii, 2, pp. 119–134, 2 pl., 1 graph, 1940.]

WALLACE (T.). **Chemical investigations relating to magnesium deficiency of fruit trees.**—*J. Pomol.*, xviii, 2, pp. 145–160, 1 pl., 1940.

Chemical investigations on foliage and soil samples from ten localities in England where symptoms of magnesium deficiency [see preceding abstract] occurred in 1939 on apples, plums, black currants, and gooseberries showed that foliar magnesium deficiency symptoms were invariably accompanied by a low magnesia status in the leaves. Where lime, magnesia, or potash was deficient in the leaves, the trees in all cases showed undesirable features in growth and foliage. Liming, together with application of a complete nitrogen-phosphorus-potash fertilizer or dung, still left magnesia low, and it would seem that special dressings are required to correct this condition. The evidence in one locality clearly demonstrated that the magnesia status of the plants was not significantly affected when they passed from a condition of potash deficiency, where magnesium deficiency was not apparent, to one of potash sufficiency, where magnesium deficiency became a serious matter. The data also indicated that a period of two or three seasons may be necessary to effect improvement by dressings containing magnesium. On acid soils where lime as well as magnesium is deficient, the best and

cheapest remedy will probably be a magnesium-rich magnesian limestone, while on acid soils deficient in magnesium alone neutral salts of magnesium should prove suitable.

In two experiments deficiencies in nitrogen, phosphorus, potassium, calcium, or magnesium increased the susceptibility of gooseberries in sand culture to lime-sulphur spray injury.

WALKER (E. A.). **Scab of Apples in storage.**—*Trans. Peninsula hort. Soc.*, xxix, 5, pp. 105–111, [?1940].

In studies conducted in Maryland of the development of scab (*Venturia inaequalis*) on stored apples [*R.A.M.*, xix, p. 353], over 11,000 Delicious and nearly 26,000 Williams's Early Red fruits from well-sprayed trees were examined at harvesting and the early scab lesions on them were found to be most numerous at the calyx end: 80 per cent. of those on Delicious and 73 per cent. of those on Early Red. At the end of four months' storage the number of lesions originally present showed under 1 per cent. increase, and the size of the pre-storage lesions had increased by 10 per cent.

Stayman fruits from sprayed trees were placed in cold storage and home cellar storage at 50° to 55° F. After two months, those in the home cellar began to show numerous black and brownish, smooth lesions under the cuticle; about 50, 40, and 10 per cent. of these lesions developed on the stem, middle, and calyx thirds of the fruits, respectively. This indicates that storage scab lesions develop most frequently on the stem end, and pre-storage ones most frequently on the calyx end of the fruit.

Stayman apples (wrapped in waxed paper) after seven months' storage in slatted wooden boxes showed only one-third as many storage lesions as similar wrapped fruits kept in pasteboard boxes.

It was observed that storage scab lesions differ so much from those appearing on the fruit at harvest time that they may be mistaken for some form of functional spotting or fungal spot. During storage pre-storage lesions grew in a spreading, irregular manner. The spreading, subcuticular margin was of two types, coal-black and regular, or brownish to black and rather irregular. On Stayman and Delicious fruits the cuticle above the lesions did not rupture. A second type of lesion appeared as small, brown or black, shiny areas under the cuticle, growing out underneath, but not rupturing the cuticle. A third kind of lesion was much smaller, and dull grey-black; the mycelial mat raised the cuticle at irregular intervals, causing the surface of the lesion to be rough to the touch, and sometimes slightly rupturing the cuticle.

MARSH (R. W.). **Notes on the use of certain sulphur preparations in Apple spraying.**—*Rep. agric. hort. Res. Sta. Bristol, 1939*, pp. 42–51, [1940].

During 1938 widespread reports were received at Bristol that injuries caused to apple trees by cold weather in spring were aggravated by the effects of lime-sulphur spraying. Attention was therefore directed to the possibilities of finding sulphur-containing sprays which would effectively control scab [*Venturia inaequalis*] without damaging the foliage. In one test seven-years-old Cox's [Orange Pippin] and Worcester

[Pearmain] trees were sprayed with 2 per cent. lime-sulphur on 2nd May and 1 per cent. on 6th June, alternate blocks being treated with ammonium polysulphide at the same concentrations and on the same dates. A block of unsprayed trees ran transversely through the sprayed ones. Both sprays were applied in large quantities at a pressure of 350 lb. per sq. in. On Worcester Pearmain trees the ammonium polysulphide, lime-sulphur, and no treatment gave, respectively, 5·1, 9·9, and 51·1 per cent. infection, while on Cox the corresponding figures were 2·2, 4·6, and 34·7 per cent. No spray damage was observed.

Estimates of mildew [*Podosphaera leucotricha*] infection on Cox's Orange Pippin trees treated since 1937 showed that in 1939 the unsprayed controls had 100 per cent. increased infection as compared with 1938; wettable sulphur (U.K.), hydrated lime, and casein (6–8–2–100 in April and 3–8–2–100 in June) gave 22 per cent. increase, lime-sulphur (3 gals. per 100 in April and 1 in June) 17, wettable sulphur (U.K.) and gelatine (6–1–100 in April and 3–1–100 in June) 9, and flotation sulphur cream (U.S.), 20 lb. per 100 in April, 10 in June, 6; while lime-sulphur, hydrated lime, casein, and cottonseed oil (3 gals., 8 lb., 2 lb., and 1 gal. per 100 in April, 1 gal., 8 lb., 2 lb., and 1 gal. per 100 in June) gave 14 per cent. decrease. The last-named treatment is too injurious for general use on Cox's apples.

When apple trees of ten commercial varieties were sprayed with (*a*) lime-sulphur 1 per cent., (*b*) an English ground sulphur wettable powder at 0·3 per cent., or (*c*) an American flotation sulphur paste at 0·3 per cent., no apparent spray damage resulted on Allington [Pippin], [Beauty of] Bath, Blenheim [Orange], Grenadier, Worcester Pearmain, or Bramley's [Seedling], while on Lane's [Prince Albert] the average yields per tree for the three treatments were 11, 54, and 71 lb., as compared with 209 lb. for the untreated trees, on Rival the corresponding figures were 40, 139, 105, and 389 lb., on Newton [Wonder] they were 171, 222, 230, and 551 lb., and on Cox 173, 111, 297, and 695 lb. In general, it is evident that circumstances favouring injury by lime-sulphur are also conducive to damage by sulphur pastes and powders, though these usually cause less injury than the first-named. Under English conditions, wettable and flotation sulphurs are useful where frequent summer applications are practicable, and should be regarded as adjuncts to the main scab control programme. There is no evidence to justify their use to displace lime-sulphur from the applications up to and including petal fall. The evidence indicates that colloidal, wettable, and flotation sulphurs are less injurious than lime-sulphur, but they are all able to damage sulphur-sensitive varieties. In conditions predisposing to spray injury any of these sulphur-containing products may cause serious leaf-shedding and fruit-drop. A correction of the conditions conducing to damage, such as nutritional deficiency, is likely to be of more value to growers than any weakening of the spray treatments to a point where adequate scab control becomes jeopardized.

KEARNS (H. G. H.) & MARTIN (H.). **Spraying farm orchards in war time.**—*Rep. agric. hort. Res. Sta. Bristol, 1939*, pp. 35–41, [1940].

Spray programmes are laid down for the economical and effective control of the chief diseases and pests in different types of apple

orchards (newly planted, established cider, old farm, and mixed farm orchards), with notes on the materials and methods used, and costs.

MARSH (R. W.) & SWARBRICK (T.). **Notes on the incidence of Plum bacterial canker in relation to methods of propagation.**—*Rep. agric. hort. Res. Sta. Bristol, 1939*, pp. 85–87, [1940].

Observations since 1928 have shown that in Worcestershire the plum variety most susceptible to bacterial canker [*Pseudomonas mors-prunorum*: *R.A.M.*, xviii, p. 654] is Giant Prune; Victoria is only slightly less susceptible, but Pershore, though often attacked, is less frequently girdled and killed than either of the others. Observations indicate that in low-worked trees Kentish Bush is a satisfactory root-stock for Victoria and Giant Prune, the last-named being very resistant on this stock. Top-worked on to young Pershore trees Giant Prune makes satisfactory growth, but top-working of Victoria on to Pershore results in a tree wanting in vigour.

HICKMAN (C. J.). **The red core root disease of the Strawberry caused by Phytophthora fragariae n.sp.**—*J. Pomol.*, xviii, 2, pp. 89–118, 3 figs., 3 graphs, 1940.

An investigation of the red core disease of cultivated strawberries [*R.A.M.*, xviii, p. 809] begun at Westerham Hill, Kent, in 1938, showed that since its first occurrence in that district in 1935, the disease had spread to 50 fields. It also occurs in Hampshire, Somerset, Devon, and Cornwall. In Scotland, where it was first noticed in 1921, the disease has already severely crippled the industry. It is believed that the American red stele root disease [ibid., xix, p. 550] is similar to, if not identical with, that under investigation. The symptoms of red core appear in early or late summer. The plants cease to grow, remain dwarfed, and produce few or no runners and small leaves on short petioles; the foliage turns blue-green and becomes tinged with red, yellow, and brown. Ultimately the plants wilt and collapse. Less frequently they may wilt quite suddenly without noticeable previous symptoms. Affected plants bear no fruits or only a few undersized, dry, and useless ones. Sometimes recovery takes place after fruiting, but is only temporary. The disease attacks mainly the roots, the decay and death of which spread from the tips of main roots backwards, few lateral ones being produced. The external root symptoms may be not very conspicuous, the most characteristic being the red discoloration of the central vascular cylinder, which can be observed from late autumn to the spring. This discoloration can sometimes be found in roots which outwardly appear quite healthy. Young roots are particularly liable to attack.

The causal organism, which is described [with a Latin diagnosis] as a new species, *Phytophthora fragariae*, was isolated in pure culture, and its pathogenicity proved beyond doubt by inoculation with pure cultures of the fungus. Details are given of two sets of inoculation experiments; in the first the culture inoculum was added to the soil and infection took place in all the 24 plants inoculated, none of the controls being attacked. In a second experiment zoospores were used as the inoculum with similar results. Attempts to induce the fungus to attack living plants other than strawberry have so far failed. The fungus grew vigorously on Quaker

oat and French bean agars, but not on malt extract agar. The optimum temperature for development was 20° C.; there was no growth at 30° and very little at 4°, although the fungus appeared to be capable of withstanding temperatures below zero for short periods. The sexual organs developed sparingly in pure culture. The mycelium is hyaline, usually non-septate, and both inter- and intracellular; the terminal sporangia are borne on undifferentiated sporangiophores 10 to 800 μ long; they are usually inversely piriform, less commonly ovoid or ellipsoidal, non-papillate with a bluntly rounded apex, 32 to 90 by 22 to 52 (average 60 by 38) μ; they have thick walls with slight apical thickening and liberate zoospores, producing germ-tubes rarely. After the evacuation of a zoosporangium, further sporangia may be repeatedly formed (up to four times) from within the base, either within or protruding beyond the sporangium. Less often sporangia may also be formed sympodially on short lateral branches arising immediately beneath the original sporangium. Sexual organs develop most abundantly in the vascular tissue. Oogonia are terminal or lateral, commonly globose with a funnel-shaped base, 28 to 44 (average 39) μ in diameter, becoming golden-brown with age. The terminal or rarely intercalary antheridia are amphigynous or less commonly paragynous, measure 16 to 30 by 12 to 22 (average 22 by 16) μ, and are sometimes provided with short hyphal projections. The oospores are spherical, subspherical, or more irregular in shape and lie free within the oogonium; they measure 22 to 44 (average 33) μ in diameter when spherical, and are hyaline with a thick (3 μ), smooth wall.

In the earliest stage of infection seen in microtomed sections of roots the mycelium was present in the root cap and the vascular cylinder and cortex behind. No entry was apparent through the cortical tissues of the main root and it is believed that primary infection occurs through the root tips. In late spring and early summer, when the symptoms are developing in the aerial parts, the activity of the fungus ceases. It is then practically impossible to isolate the fungus and newly formed roots do not become infected. Secondary fungi may now mask the *Phytophthora*, species of *Pythium* and less commonly *Rhizoctonia* following the *Phytophthora* closely. The virulence of the fungi associated with root rots of the black lesion type [ibid., xiv, p. 179] is of a very low order compared with that of *P. fragariae*. In most varieties of strawberry the fungus is confined to the roots, but in some it advances into the rootstock. The disease is favoured by a high water content of the soil due to poor drainage. Some evidence was obtained indicating that the disease may be inhibited by soil alkalinity. In varietal tests none of the common varieties was immune, but Pillnitz, Early Cambridge, and Oberschlesien were fairly resistant and the immunity of four new seedling varieties from Scotland was confirmed. The spread of the disease to England is considered to be a very serious problem. The disease is undoubtedly transmitted from one locality to another by infected runners and the utmost care should be exercised to use only runners from healthy sources. It is believed to be impracticable to control the disease by means of eradication, crop rotation, or soil disinfection, but some hope is entertained of the possibility of combating it by the use of immune varieties.

CROWELL (I. H.). **Rhizoctonia solani on Strawberries in transit.**—*Plant Dis. Reptr*, xxiv, 10, p. 207, 1940. [Mimeographed.]

A species of *Rhizoctonia* [cf. *R.A.M.*, xix, p. 26], presumably *R.* [*Corticium*] *solani*, was the only organism isolated from infected strawberries in a refrigerated car-lot shipment sent from Louisiana to Montreal. The berries were uniformly infected and showed symptoms very similar to those described for leather rot (*Phytophthora cactorum*) [loc. cit.].

MAGEE (C. J. P.). **Transmission studies on the Banana bunchy-top virus.**—*J. Aust. Inst. agric. Sci.*, vi, 2, pp. 109–110, 1940.

In this preliminary report of studies on the transmission of the banana bunchy top virus [*R.A.M.*, xix, p. 31] it is stated that attempts to transmit the disease by mechanical inoculations were unsuccessful. Positive results were obtained with individuals of both the winged and wingless adult forms of the aphid *Pentalonia nigronervosa* [ibid., xv, p. 592] and with each of their four nymphal stages, approximately 46 per cent. of the 233 individuals of all stages having transmitted the disease. Adult aphids fed on infected leaves transmitted the virus much less frequently than nymphal forms fed on the same inoculum. The virus was not transmitted by infective adults to their progeny (which is viviparous and agamic). Infection apparently occurred with minimal dosages of the virus, as an increase in the number of infective aphids affected only the frequency of infection and not the severity of symptoms or the minimum incubation period for the disease. The virus was transmitted by infective aphids after feeding periods on susceptible plants of not less than 1½ to 2 hours. For acquisition of the virus by nymphs a feeding period on the infected plant of not less than 17, but preferably 24 hours, was required. Temperatures of 10° and 15° C., by lessening the vitality of infective aphids and their inclination to feed, reduced the number of successful transmissions; this fact may be of importance in determining the low winter incidence of the disease. The aphids may retain their infectivity in daily transfers to fresh plants for as long as 13 days after removal from infected plants. Nymphs may carry the virus through their moults. Some length of time, varying individually from a few hours to about two days, elapses between the feeding on infected plants and the development of infective power. In infected leaves detached from plants and kept fresh the virus persisted for at least 12 days. Although the virus causes systemic infection, it is not found in every part of the infected plants, but only in the first-symptom leaf (and in this only in the green streaks and the vascular bundles showing abnormal phloem) and in leaves developing after infection.

GONÇALVES DA SILVA (S.). **A antracnose do Caqui.** [Persimmon anthracnose.]—*Biologico*, vi, 5, pp. 125–126, 1940.

Persimmons in Brazil are reported to be liable to infection by *Colletotrichum gloeosporioides* [cf. *R.A.M.*, xi, p. 313], which produces on the fruits sunken, nearly black, pale-bordered lesions, attaining a diameter of 1 cm. or more and sometimes coalescing to form large necrotic areas. The entire pulp is invaded right through to the stone and converted into

a blackened, desiccated framework of fibres. Diseased fruits are unfit for consumption and are mostly shed prematurely. Masses of gelatinous, pink spores are formed in concentric zones on the older spots and conveyed by wind, water, or insects to healthy fruits. Control measures should include, in addition to routine practices of orchard sanitation, a spray schedule consisting of one winter application (after the pruning of the branches) of lime-sulphur (1 in 40) and three to four treatments at 15- to 20-day intervals during the growing period with 1 per cent. Bordeaux mixture. Preliminary observations indicate that the Mikado variety of *Diospyros kaki* is more resistant than the elongated fruit of an undetermined form, possibly a hybrid between *D. kaki* and *D. virginiana*.

McKee (R. K.). **Experiments on the control of Mango anthracnose by spraying.**—*Trop. Agriculture, Trin.*, xvii, 6, pp. 115–117, 1940.

Particulars are given of a three-year (1937 to 1939) spraying trial for the control of mango anthracnose (*Colletotrichum gloeosporioides*, the conidial stage of *Glomerella cingulata*) in Trinidad [*R.A.M.*, xvii, p. 403], the results of which showed 1 per cent. Bordeaux mixture to be very effective against the development of the fungus in stored mangoes of the Julie variety. In 1937 20 per cent. wastage of the fruits from treated trees sprayed weekly from flowering time until harvest occurred in 7·7 days, compared with 5·8 for the unsprayed controls, the figures for fruit from trees given two applications, sprayed for half the season, sprayed throughout the season, and unsprayed controls in 1930 being 5·5, 7·2, 8·5, and 5·3, respectively, and in 1939 6·7, 7·2, 7·7, and 5·7, respectively. The increase in storage time given by spraying the whole season should amount in good years to two days and in bad years to over three days. In 1939 even two sprays at flowering directed mainly against blossom blight gave a noticeable increase in storage time. Generally speaking, young fruit is more susceptible than mature to anthracnose, so that the most appropriate times for spraying would be about the flowering season, during which two treatments may be given, followed by an occasional application until half the full size is attained. In the exceptionally wet year of 1938, however, the end-of-season treatments were more successful than those given earlier. The beneficial effect of spraying in any one year was found to persist into the next.

Cunningham (G. H.). **Certification of therapeutants.**—*N.Z. J. Sci. Tech.*, A, xxi, 6, pp. 319–321, 1940.

A list (the sixth), dated February, 1940, is given of 31 fungicides and insecticides approved after rigorous laboratory and field tests by the Plant Diseases Division, Plant Research Bureau, New Zealand Department of Scientific and Industrial Research [*R.A.M.*, xviii, p. 235].

Howard (F. L.). **Chloropicrin, steam, carbon disulphide, and other treatments for the control of injurious soil microorganisms.**—*Rep. Veg. Gr. Ass. Amer.*, *1939*, pp. 115–130, 5 figs., 1940.

The chief feature of this report is a full account concerning the successful application of chloropicrin as a soil fumigant at the Rhode

Island Agricultural Experiment Station [*R.A.M.*, xix, p. 165], where it has been found effective against fungi causing disease and weed seed, as well as insects and eelworms.

CROXALL (H. E.) & OGILVIE (L.). **A note on the incorporation of growth promoting substances in seed dressings.**—*Rep. agric. hort. Res. Sta. Bristol, 1939*, pp. 100–102, [1940].

This is a condensed account of work fully described in a paper already noticed from another source [*R.A.M.*, xix, p. 322].

BERRY (W. E.). **Spray injury studies. Progress Report II. The effects of time and temperature on the production of hydrogen sulphide during atmospheric decomposition of lime sulphur.**—*Rep. agric. hort. Res. Sta. Bristol, 1939*, pp. 52–56, 1 graph, [1940].

After referring to his earlier investigations [*R.A.M.*, xviii, p. 750], which indicated that hydrogen sulphide production may play a part in lime-sulphur spray injury, the author describes an experiment carried out to determine the rate of hydrogen sulphide production when the wash was exposed to the action of air, by drawing air through it.

The [tabulated] results showed that the time elapsing before sulphur was deposited differed at different temperatures, but deposition always occurred shortly after hydrogen sulphide evolution had attained a maximum. It is concluded that when lime-sulphur is exposed to air, decomposition by carbon dioxide begins almost at once. Oxidation is at first retarded, but later predominates. As polysulphide and sulphide begin to be decomposed by oxygen, the amounts available for decomposition by carbon dioxide are rapidly reduced, and hydrogen sulphide production declines. With increasing temperature hydrogen sulphide production was expedited; the rates of oxidation and decomposition by carbon dioxide were increased, and the maximum rate of hydrogen sulphide production was thus reached earlier at higher than at lower temperatures.

The data indicate that, if hydrogen sulphide evolved from lime-sulphur is a factor in spray injury, it exerts its maximum effect very soon after spraying. In practice, a much larger surface of solution would be exposed to the atmosphere than was the case in the author's experiments, and the normal concentration of carbon dioxide in the air might be increased by the respiration of the leaves. The former condition would accelerate decomposition, while the latter would increase hydrogen sulphide production.

KEARNS (H. G. H.). **A simple connector for overland steel spray mains.**—*Rep. agric. hort. Res. Sta. Bristol, 1939*, pp. 57–59, 2 figs., [1940].

A description is given of a cheap, simple device to replace the unsatisfactory rubber connexions used with overland steel mains in orchard spray apparatus. Used successfully in long lengths of steel mains, it consists of two main parts, a hexagonal nut gunmetal bush and a gunmetal cap with a lining of B.S.P. red steam barrel nipple, fitted with a gunmetal collar at one end. Each steel main has a bush on one end, and a cap and lining on the other. The cost of converting existing types

of flexible connectors to the all-metal type amounts to 1*s*. 6*d*., including materials and labour.

WILCOX (L. V.). **Determination of boron in plant material. An ignition-electrometric titration method.**—*Industr. Engng Chem., Analyt. Ed.*, xii, 6, pp. 341–343, 1 diag., 1940.

Full details are given of the electrometric titration method for the determination of boron in plant material. Experiments at the Rubidoux Laboratory, Riverside, California, have shown the technique to be eminently suitable for the low concentrations (in the range below 50 mg. per kg. of dry material) occurring in boron deficiency studies.

JOHANSEN (D. A.). **Plant microtechnique.** First Ed.—viii+523 pp., 109 figs., London, McGraw-Hill Publishing Company, Ltd., 1940. 30*s*.

This manual is mainly concerned with histological methods and its specific aim is to enable students, instructors, and research workers to prepare their own microscope slides of plant materials. The text is divided into two sections, the first dealing with botanical technique in general and the second giving detailed directions for the treatment of special groups. Chapters on bacteria and fungi are included in the latter section.

GALLOWAY (L. D.) & BURGESS (R.). **Applied mycology and bacteriology.** Second Ed.—viii+186 pp., 21 figs., 1 diag., London, Leonard Hill, Ltd., 1940. 10*s*.

The second printing of this manual [*R.A.M.*, xvii, p. 262] has afforded an opportunity of revising the text and bibliographical references in the light of the most recent discoveries in the microbiological field.

HANSEN (C.). **Formation of mould and fungi on paint films.**—*Paint Varn. Prod. Manuf.*, xx, 6, pp. 146–151, 1940.

In the course of this general survey of the conditions influencing the development of moulds on paint films in the United States [*R.A.M.*, xix, p. 553], the writer states that *Penicillium glaucum* is usually found in moist, shady situations, *Aspergillus flavus* is prevalent in breweries, and the brownish-red *Phoma* [ibid., xvii, p. 195] flourishes in hothouses. The use of a mixture of red seal lithopone paint and zinc oxide (2 to 3:1) is recommended for outside applications. Top-varnish coats should consist of oil-free materials. Infected wood requires a hard-drying disinfecting primer similar to ship bottom paints; under certain conditions, such as those prevailing in breweries, the base surface should be treated with mercuric chloride or thymol.

WEISS (F.). **Foreword to the revised check list of diseases of economic plants of the United States.**—*Plant Dis. Reptr*, xxiv, 7, pp. 140–148, 1940. [Mimeographed.]

In this foreword the author explains the scope and arrangement of the revised 'Check list of diseases of economic plants in the United States' now in preparation. The section dealing with *Abies* is given as a sample of the work and it is planned to present further sections from time to

time prior to the publication of the entire list. [The *Acer* section appears in *Plant Dis. Reptr*, xxiv, 10, pp. 190–201, 1940.]

WALLACE (J. C.). **Potato spraying or dusting in war time.**—*J. Minist. Agric.*, xlvii, 1, pp. 49–55, 1940.

Brief recommendations are given in popular terms for the control of potato blight [*Phytophthora infestans*] by the elimination of diseased tubers, the destruction of initial infection centres, spraying with fungicides, and the destruction of diseased foliage with sulphuric acid [*R.A.M.*, xvii, p. 131]. It is pointed out that proprietary dusts vary greatly in their copper content, which amounts to less than 10 per cent. in some and to 24 per cent. in others. Experiments over a period of years have shown that to secure good average control, the dust used should contain at least 15 per cent. metallic copper (or 18·75 per cent. copper oxide or 2·3 per cent. copper hydrate). In some years higher percentages gave significantly better results. At the start of the spraying season applications should be made at the rate of about 50 gals. spray or 10 lb. dust per acre, increasing to 100 gals. or 20 lb. when the plants are in full foliage.

FOISTER (C. E.). **Dry rot diseases of Potatoes.**—Reprinted from *Scot. J. Agric.*, xxiii, 1, 7 pp., 5 figs., 1940.

Apart from late blight (*Phytophthora infestans*), which may under certain conditions cause a dry decay of potato tubers simulating dry rot proper, the latter disease, or rather collective group of diseases, is associated in the British Isles with *Fusarium coeruleum* [*R.A.M.*, xviii, p. 409] and a species of *Phoma* [ibid., xvi, p. 272] responsible for 'gangrene', the symptoms of which are described in detail. Both dry rot and gangrene are essentially storage disorders and reduce the amount of healthy stock available for planting. Gangrened tubers, however, unlike those invaded by *F. coeruleum*, will yield a normal crop unless the bulk of the tuber, including the eyes, is involved in the soft-rot stage of the disease. *F. coeruleum* is known to be capable of persisting in the soil and infecting the tubers *in situ*, but it is not yet certain whether this also applies to the gangrene fungus. Dry rot is usually more severe on early varieties in sprouting boxes than on late ones in pits, although heavy infection may also develop under the latter conditions following opening for the dressing and dispatch of stocks, which permits the access to the tubers of the oxygen necessary for the spore germination in *F. coeruleum* and probably also in *P.* sp. In addition to soil contamination dry rot spreads from infected to healthy tubers, probably through the agency of mites and other pit, store, and shed insects, even under dry conditions. Other common sources of perpetuation, especially of *F. coeruleum*, are infested stores and boxes.

Symptoms of both dry rot and gangrene may appear as early as October, but most of the infection develops later in the season, becoming progressively more acute with the advance of maturity in the tubers from December and January onwards. Mechanical damage through any of the processes connected with lifting, storage, and transport is an important contributory factor in the development of dry rot, but gangrene is less dependent on injuries of this type as a mode of ingress.

Both *F. coeruleum* and *P.* sp. are most common and severe on early and second-early varieties, those chiefly affected being May Queen, Sharpe's Express, Duke of York, Catriona, and Di Vernon, while the former organism also attacks Ninetyfold and occasionally seriously damages Dargill Early, Arran Pilot, Arran Comrade, and Majestic (late), and the latter also occurs commonly on Arran Pilot, British Queen, and the later-maturing Ally, Doon Star, Great Scot, King Edward, and Majestic.

On the basis of these preliminary studies the following control measures are recommended; careful handling of the crop to avoid mechanical injury; storage in sprouting-boxes where the tubers, especially of early varieties, can be under constant observation, in a well-ventilated, cool place with sufficient light; disinfection of all boxes and of the entire storage room with formalin at a minimum strength of 5 per cent. before restocking with potatoes; burning of badly diseased tubers, those less severely infected serving as pig fodder after cooking; immersion of the tubers on lifting in a 0·1 per cent. solution of a standard organic mercurial compound or 1 per cent. formalin for 1 and $\frac{1}{4}$ to $\frac{1}{2}$ minute, respectively; and (for seed tubers as a protection against dry rot) premature lifting and leaving the tubers to green on the field.

ENDO (S.). **Studies on sclerotial diseases of the Rice plant in China. I. Morphology and pathogenicity of Sclerotium oryzae-sativae Sawada.**—*Ann. phytopath. Soc. Japan*, x, 1, pp. 7–15, 3 figs., 1940. [Japanese, with English summary.]

The dimensions of the sclerotia of *Sclerotium oryzae-sativae* [*Leptosphaeria salvinii*] collected on rice in southern China varied on potato decoction agar with the locality of origin, ranging from 267 to 1,666 by 267 to 1,200, 333 to 1,733 by 267 to 1,466, and 267 to 1,466 by 267 to 1,333 μ, respectively for the Amoy, Tan-kuei-t'sun, and Fui Sha Wei strains. The sizes of the cells composing the sclerotia of the three strains were 11·1 to 28·9 by 11·1 to 26·7, 11·1 to 24·4 by 11·1 to 22·2, and 13·3 to 28·9 by 11·1 to 28·9 μ, respectively. In inoculation tests on the leaf sheaths of the Miisinriki variety the strongest pathogenicity was exhibited by Fui Sha Wei and the weakest by Tan-Kuei-t'sun, Amoy being intermediate in this respect.

VAN HELL (W. F.). **Het gebruik van kalk als kleurstof voor desinfectiemiddelen, die met water emulgeerbar zijn.** [The use of lime as a colouring agent for water-emulsible disinfectants.]—*Bergcultures*, xiv, 22, pp. 719–721, 2 figs., 1940.

Experiments having shown that slaked lime, commonly used as a colouring agent for izal, carbolineum, and other fungicides applied to the tapped surfaces of *Hevea* rubber trees in Sumatra, is quite unsuitable for this purpose, since it breaks up the emulsion and permits flocculation in the form of thick drops of tar oil, the writer recommends its replacement by white chalk, white clay, methylene blue, fuchsin, red ochre, or rhodamin B.

ELLIS (M.). **Some fungi isolated from Pinewood soil.**—*Trans. Brit. mycol. Soc.*, xxiv, 1, pp. 87–97, 1 fig., 1940.

Samples of soil (P_H 4) were collected in the early autumn from a Scots

pine (*Pinus sylvestris*) wood near Nottingham, material being taken from the side of a pit, 4 ft. deep, at depths of 4 and 10 in. and removed in sterile containers to the laboratory, Nottingham University College. Two modes of isolation were used, viz., Waksman's 'direct method' [*R.A.M.*, ii, p. 233], in which fragments of soil are placed directly on the medium and incubated for 24 hours at 22° C., and another involving the suspension of 10 gm. samples in 100 c.c. sterile water, with drops of which plates were inoculated and incubated for ten days at 22°. The media used for isolation were soil extract and glucose-peptone agars. The following species were isolated (total from both methods): *Botrytis cinerea*, *Mortierella hygrophila*, *M. gemmifera* n.sp. [a Latin diagnosis of which is given], *Mucor hiemalis*, (?) *M. sylvaticus*, *M. ramannianus*, *Rhizopus nigricans*, *Trichoderma koningi* [*T. viride*], *T. lignorum* [*T. viride*], *T. album*, *Zygorrhynchus moelleri*, *Absidia spinosa*, *Acrostalagmus cinnabarinus*, *Alternaria tenuis*, *Aspergillus sydowi*, *Penicillium cyclopeum*, and *P.* spp.

Most of the fungi enumerated have been found by other workers in the acid forest soils of temperature climates, of which they may, in fact, be regarded as typical [cf. ibid., xviii, p. 137 *et passim*]. There was little difference in the fungal population between the 4 and 10 in. samples.

HOERNER (G. R.) & RABAK (F.). **Production of Hops.**—*Fmrs' Bull. U.S. Dep. Agric.* 1842, 40 pp., 21 figs., 1940.

Popular notes are given (pp. 26–31) on the following diseases to which hops are subject and their control in the United States: downy mildew (*Pseudoperonospora humuli*), which may be combated by dusting with a copper sulphate-lime mixture (1:10) or spraying with a 4–4–50 zinc sulphate-lime solution plus 1 quart of rosin soap as a spreader; sooty mould, stated to be responsible for serious annual losses throughout the country, especially when the associated aphid penetrates the cones and thus permits the development of infection in the interior [cf. *R.A.M.*, viii, p. 16]; root rots, usually resulting from mechanical injuries and characterized by a dry decay and brownish or black discoloration of the diseased tissues; virus disorders; and powdery mildew [*Sphaerotheca humuli*], apt to cause heavy damage under favourable climatic conditions in New York and controllable by sulphur dusting or spraying.

SEAVER (F. J.) & WATERSTON (J. M.). **Contributions to the mycoflora of Bermuda. I.**—*Mycologia*, xxxii, 3, pp. 388–407, 6 figs., 1940.

This annotated list of over 50 fungi collected in Bermuda by the senior author in the autumn of 1938 includes 10 new species. Among the new records is included *Agaricus* [*Psalliota*] *campestris*, observed to be well established in a field on Kitchener's (Hinson) Island.

CUMMINS (G. B.). **Uredinales of New Guinea.**—*Mycologia*, xxxii, pp. 359–375, 14 figs., 1940.

This annotated list of 34 species of Uredinales collected by Mrs. Mary Strong Clemens in Morobe District, New Guinea, comprises 20 new species, one new combination, and one new genus.

THURSTON (H. W.). **The rusts of Minas Geraes, Brazil, based on collections by A. S. Müller.**—*Mycologia*, xxxii, 3, pp. 290–309, 1940.

This is an annotated list of 108 rusts (comprising six described as new) collected by A. S. Müller in Minas Geraes, Brazil.

YAMAMOTO (W.). **Formosan Meliolineae I.**—*Trans. nat. Hist. Soc. Formosa*, xxx, 200–201, pp. 148–158, 1940.

This is an annotated list of 33 Meliolineae [cf. *R.A.M.*, xiv, p. 532; xvii, p. 415] occurring (mostly on ornamentals) in Formosa, Japan. *Meliola butleri* is found on pomelo, *Citrus poonensis*, and *C. tankan* [ibid., ix, p. 64], and *M. mangiferae* on mango.

WAKSMAN (S. A.). **On the classification of Actinomycetes.**—*J. Bact.*, xxxix, 5, pp. 549–558, 1940.

Details are given of a proposed classification of the order Actinomycetales [cf. *R.A.M.*, xix, p. 436].

PETCH (T.). **Tubercularia.**—*Trans. Brit. mycol. Soc.*, xxiv, 1, pp. 33–58, 1940.

This is a critical study of the commoner British species of *Tubercularia*, the cultural work on which was carried out exclusively on oatmeal agar. The conclusion of Tulasne and Saccardo that *T. minor* is only a form of *T. vulgaris* is accepted, and an examination of the records and herbarium specimens of the remaining British species results in the reduction to synonymy with the latter of all but *T. versicolor*. *Nectria cinnabarina* is accepted as the ascigerous stage of *T. vulgaris*, *N. fuscopurpurea* and apparently *N. cinnabarina* var. *minor* being synonymous.

PETCH (T.). **Xylaria.**—*Naturalist, Lond.*, *1940*, 779, pp. 153–156, 1940.

Evidence is briefly adduced to the effect that *Xylaria vaporaria* and possibly *X. tulasnei*, recently recorded as infesting cultivated mushroom [*Psalliota* spp.] beds [*R.A.M.*, xvii, p. 93] in England, are synonymous with *X. pedunculata*, *X. tulasnei* being a small form, with spores only half the size of those of *X. pedunculata* itself. Notes are given on other British species of the genus, the total number of which is reduced from 15 to 11.

JOHNSON (E. M.) & VALLEAU (W. D.). **Control of blackfire of Tobacco in Western Kentucky.**—*Bull. Ky agric. Exp. Sta.* 399, pp. 19–39, 6 figs., 1 diag., 1940.

In a comprehensive series of experiments carried out in western Kentucky from 1936 to 1939, Bordeaux mixture (3–3–50) sprinkled on tobacco beds with a watering pot, when the first true leaves appeared, and again 10 to 14 days later, in most cases completely prevented the development of wildfire (*Bacterium tabacum*) and angular leaf spot (*Bact. angulatum*), while blackfire (a late-season condition induced by either organism in association with wet weather and unsatisfactory soil conditions) [*R.A.M.*, xviii, p. 576; xix, p. 305] was prevented or delayed in fields set from the treated beds. In the few treated beds in which

these diseases did appear fewer than 12 affected plants per bed were found.

In 1936, 1937, and 1939, injury from blackfire to dark tobacco types in fields set from treated beds was slight, though up to 50 per cent. damage occurred in fields from untreated beds. In 1938, when heavy rain fell throughout the growing season, the average loss in fields from treated and untreated beds was 39 and 65 per cent., respectively.

Wildfire and angular leaf spot appeared in the field shortly after setting when present in the bed; the size and number of the spots gradually increased, and when rains were frequent or heavy, damage from blackfire rapidly ensued. In 1938 many fields that showed wildfire or angular leaf spot shortly after setting were destroyed by blackfire by mid-July, though fields from treated beds were only slightly affected even a month later.

Blackfire rarely occurs on fertile soils but is often epidemic on soils of low fertility; the condition can be readily induced in tobacco on infertile soil by inoculation with the two bacteria. In western Kentucky, where much damage is caused, over 80 per cent. of the fields are low in phosphorus and potassium. A system of soil management which builds up large reserves of available plant food is considered essential for purposes of control.

Using a rotation with two to several years of a grass-legume mixture, not over-heavily pastured, and abundant applications of manure and fertilizers, dark tobaccos can be topped at 16 to 20 instead of 10 to 12 leaves, and will probably give increased yields of high quality tobacco relatively free from blackfire injury. The evidence indicates that applications of well-rotted stable manure frequently prevent blackfire damage.

Darkis (F. R.), Vermillion (H. E.), & Gross (P. M.). **p-dichlorobenzene as a vapor fumigant: physical and chemical studies.**—*Industr. Engng Chem.*, xxxii, 7, pp. 946–949, 1 fig., 1 diag., 2 graphs, 1940.

Full details are given of experiments at Duke University, Durham, North Carolina, on the following phases of the para-dichlorobenzene treatment of blue mould of tobacco [*Peronospora tabacina*: *R.A.M.*, xix, p. 439 and next abstracts]: the effect of the five crystal sizes available on the market on the rate of evaporation, methods for the estimation of the fumigant in the atmosphere, and the determination of the vapour pressure of the crystalline solid in the temperature range of 10° to 50° C. The rate of loss of para-dichlorobenzene was found to be less for the larger crystal sizes of smaller exposed surface per unit weight and to decrease with a falling temperature. The smaller the crystal size, therefore, the slighter is the effect of a rise in temperature on the vaporization rate.

Pinckard (J. A.), McLean (Ruth), Darkis (F. R.), Gross (P. M.), & Wolf (F. A.). **Toxicity of paradichlorobenzene in relation to control of Tobacco downy mildew.**—*Phytopathology*, xxx, 6, pp. 485–495, 1 diag., 1 graph, 1940.

Much of the writers' experimental work (forming part of a co-opera-

tive study by the Virginia Agricultural Experiment Station and Duke University, North Carolina) on the factors affecting the toxicity of para-dichlorobenzene to tobacco downy mildew (*Peronospora tabacina*) has already been described [*R.A.M.*, xix, p. 306], but attention may here be drawn to the following point. Three or four consecutive treatments with the fumigant at the minimal effective concentration of 0·01 to 0·02 volume per cent., equivalent to saturation pressures from 0° to 7° C., are requisite for the eradication of the fungus from seed-beds of the susceptible Yellow Mammoth, White Stem Orinoco, and Jamaica varieties.

McLean (Ruth), Pinckard (J. A.), Darkis (F. R.), Wolf (F. A.), & Gross (P. M). **The use of paradichlorobenzene in seedbeds to control Tobacco downy mildew.**—*Phytopathology*, xxx, 6, pp. 495–506, 1 fig., 1940.

In addition to information already summarized from other sources [*R.A.M.*, xviii, p. 419 and preceding abstracts], the writers' further experiments in the use of para-dichlorobenzene for the eradication of *Peronospora tabacina* from tobacco seed-beds indicated that the correct amount of the fumigant is from 1½ to 3 lb. per treatment per 100 sq. yds., applications every three or even four nights, if the covers were adequately wetted, sufficing at the higher concentration. Temperatures exceeding 7° C. should be maintained in the seed-beds to promote effective vaporization. Para-dichlorobenzene vapours are approximately five times heavier than air and their maximum concentration occurred in the air near the crystals (0·0055 to 0·0092 per cent. compared with 0·0020 to 0·0035 per cent. at soil-level). The diffusion rate of a vapour being inversely proportional to its density, the permeation of the beds by para-dichlorobenzene may be expected to occupy a considerable time.

Bennett (C. W.). **Relation of food translocation to movement of virus of Tobacco mosaic.**—*J. agric. Res.*, lx, 6, pp. 361–390, 7 figs., 2 graphs, 1940.

Experiments were carried out at the Bureau of Plant Industry, United States Department of Agriculture, to ascertain whether the correlation already established between virus movement and food translocation in raspberry leaf curl [*R.A.M.*, vi, p. 675] and sugar beet curly top [ibid., xvi, p. 650] holds good for tobacco mosaic in Turkish tobacco and *Nicotiana glauca*.

In vegetative Turkish tobacco plants with their main stems and basal suckers in horizontal and vertical positions, respectively, the basipetal movement of the mosaic virus in the main stem was rapid, the entire length of the stem (more than 24 in.) being traversed and symptoms produced on the basal sucker in an average period of 6·8 days, and its acropetal progress slow (35·5 days before the appearance of symptoms in any part of the shoots); the latter period was reduced, however, to 20 and 12 days, respectively, by darkness and defoliation. On the other hand, in plants maturing seed on the main stem acropetal movement was rapid and basipetal motion slow. In *N. glauca* plants, with top and basal grafts of Turkish tobacco separated by 3 ft. of stem, the virus

moved from the top to the basal graft and produced symptoms in six to nine days. In seven out of ten plants no upward movement of the virus took place during periods ranging from 224 to 252 days, but, as in the case of Turkish tobacco, the process was accelerated to twelve days by defoliation. Turkish tobacco roots proved susceptible to infection, but lengthy periods (up to 67 days) were required for the virus to reach the tops and produce symptoms. Removal of the tops reduced the time of passage to a maximum of 48 days.

The tobacco mosaic virus traversed the rings, breaking phloem continuity in Turkish tobacco, but its passage was delayed by an average of eight days or more. In some *N. glauca* plants the corresponding rings were not passed in periods exceeding 250 days. The cucumber mosaic virus, however, was able to traverse the rings in 37 days. The fact that the tobacco mosaic virus does not ordinarily induce mottling in *N. glauca* suggests that the parenchymatous tissue in this species may not be conducive to movement and multiplication, which might in its turn account for the inability of the virus to pass through rings interrupting phloem continuity. Support is lent to this theory by the fact that such rings are uniformly traversed by the cucumber mosaic virus, which induces mottling on *N. glauca* and is therefore no doubt abundantly present in the parenchyma.

The evidence from these studies is considered to point to a correlation between virus movement and food transport in the case of tobacco mosaic, the factors involved probably not differing in essentials from those responsible for the passage of other plant viruses.

MATSUMOTO (T.) & TATEOKA (R.). **Virus diseases of Tobacco in Formosa.** —*Trans. nat. Hist. Soc. Formosa*, xxx, 197–198, pp. 31–33, 1940.

The following virus diseases have been observed affecting tobacco in Formosa, Japan: common mosaic; mild mosaic type A (possibly identical with, or very closely related to, either of E. M. Johnson's two types of mild mosaic [*R.A.M.*, x, p. 60]); mild mosaic type B, a sap-transmissible, persistent condition characterized by faint foliar mottling, simulating veinbanding; yellow mosaic [ibid., xv, p. 533 *et passim*]; etch (probably identical with E. M. Johnson's disease of the same name); a composite disease due to a complex of common tobacco mosaic and a potato mosaic virus [ibid., xvii, p. 73]; leaf curl, transmissible by *Bemisia gossypiperda* [see above, p. 584] and most prevalent in the south near extensive cotton plantations; and other disturbances, including one attributed to a mixture of tobacco mosaic and a certain type of etch, further studies on which are pending.

MOORE (E[NID] S.) & ANDERSSEN (E. E.). **Notes on plant virus diseases in South Africa. I. The kromnek disease of Tobacco and Tomato. II. Die-back (mixed-virus streak) of Tomatoes.**—*Sci. Bull. Dep. Agric. S. Afr.* 183, 43 pp., 16 pl., 2 diags., 1939.

The results of further studies on the kromnek virus disease of tobacco and tomato in South Africa [*R.A.M.*, xiii, p. 129; xix, p. 196] seem to indicate that this disease is very similar to, and probably identical with, tomato spotted wilt [ibid., xix, p. 371]. The vector of the kromnek virus was identified as *Frankliniella schultzei*, one of the most widely dis-

tributed thrips in South Africa. To avoid the erratic results of previous transmission tests, insects used in the present study were reared from the egg stage on infected plants under controlled conditions. In tests the insects were allowed to feed for 24 hours on a confined area of the test plant, using a cage, which is a modification of that devised by Storey, and is fully described. A considerable proportion of successful transmissions was obtained on tomato, tobacco, and *Datura* plants by adult thrips; in two cases transmission was obtained with insects in the last larval stage, but in over 100 tests with young larvae up to six days old, only three transmissions were successful, indicating that an interval must elapse between the feeding of the larva on a diseased plant and the first development of its infectivity. In field studies it was observed that the incidence of kromnek in tobacco was very erratic, the percentage of fresh infection varying not only from season to season but also from month to month, and in fields in close proximity to each other. In seasons of severe outbreaks infection is general, while in other seasons it may be practically absent, even though *F. schultzei* is present in appreciable numbers. In no season have tomatoes been found to escape infection when grown in open situations. At all times the vector seems to be more attracted by the tomato than by the tobacco foliage when both are available. Strong field evidence, confirmed by successful, though few, transmissions, points to *Thrips tabaci*, which is widely distributed in South Africa, as an additional vector of the kromnek virus. The irregular incidence of the disease in the Pretoria district, which has been under observation since the serious outbreak of kromnek in commercial tomato plantings in 1933, can apparently be correlated with the relative size of a thrips population consisting mainly of *T. tabaci*, the vector mainly concerned with the spring outbreaks. Within the market garden area no extensive breeding of this species was observed on any host other than cabbage, cauliflower, and onion, but the probability of adult migration must not be overlooked. The results of spraying and dusting experiments for the control of the disease were negative. None of the ordinary commercial tomato varieties showed any marked difference in susceptibility; in tobacco the Amarelo and Burley varieties were found to suffer particularly severe damage from the disease, but others were also by no means resistant.

In the second of these two papers, by Miss Moore alone, the appearance is reported, in 1935, of an unfamiliar virus disease in the large tomato-growing areas of the eastern Transvaal. The infection is stated to have been widespread, causing great damage and loss in certain estates. In laboratory investigations in Pretoria the causative virus was separated by the use of filter plants into two constituents, No. 1 and No. 2, the latter having a higher thermal death point (89° to 90° as against 65° to 70° C.) and retaining its activity at a higher dilution (1 in 100,000 as against 1 in 500) than the former. The second constituent had all the properties of tobacco virus 1; this identity was confirmed in experiments in which tomato plants inoculated with a mixture of constituent No. 1 and tomato mosaic virus (tobacco virus 1) showed the characteristic symptoms of the die-back disease. Since it is known that streak symptoms in tomatoes are caused by a mixed infection with the viruses of ordinary tobacco mosaic and a potato virus of the X type,

some strains of the latter agreeing closely with constituent No. 1, it is concluded that the disease under observation is the same as that known in other countries as 'mixed virus streak' [ibid., xix, p. 372]. It is proposed to retain the name 'die-back' for local use, it being so characteristic a field symptom. The presence of potato virus X has not hitherto been experimentally proved in South Africa, but it was most probably imported on some of the many potato varieties which carry it without symptoms (including the Up-to-Date).

JONES (L. K.). **Fruit stripe of Tomato caused by a Tobacco type 1 virus.** —*Phytopathology*, xxx, 6, pp. 538–540, 2 figs., 1940.

Tomatoes in experimental field plots at Pullman, Washington, in 1936 and 1937 bore chlorotic to necrotic, raised, pale cream to ashen grey stripes, 1 to 2 mm. in width, extending from the stem to the blossom end and becoming broken, brownish, and sunken as the fruits enlarged. The foliage of affected plants showed a mild mosaic, without necrosis, which was also absent from the stems and petioles, in contradistinction to the symptoms of single-virus streak or of that caused by a combination of the tobacco mosaic and potato X viruses. On tobacco the virus produces only a faint mosaic on the young foliage, followed by profuse chlorotic spotting as the leaves mature. A combination of the potato X and fruit stripe viruses induced streak symptoms on tomatoes and on tobacco foliar necrosis, the manifestations in both cases resembling those due to joint infection by the tobacco mosaic and potato X viruses. The incubation period of the fruit stripe virus on tobacco and tomato ranges from 12 to 15 days; inactivation was effected by a ten-minute exposure at 90° but not at 80° C.; activity was maintained in a 1:1,000,000 dilution with water, and for a minimum period of 65 days *in vitro*. The general features of the virus under observation being identical with those of tobacco virus 1, it is accordingly regarded as a variant of tobacco mosaic.

LANCASHIRE (E. R.) & COUNTER (B. F.). **Tomato production in 1940.**—*Canning Age*, xxi, 6, pp. 261–264, 2 figs., 1940.

Tomatoes are stated to suffer from early and late blights [*Alternaria solani*: *R.A.M.*, xix, pp. 7, 440, and *Phytophthora infestans*: ibid., xviii, p. 728] in all States of the American Union except Utah, the diseases being most severe when the general level of soil fertility is low, especially with a normal or excessive July rainfall. During each of the past three years virtual crop failures have been caused by the blights in certain sections of the largest tomato-producing States. Three applications of 4–2–50 Bordeaux mixture are recommended, beginning when the plants start to bush out and open up and continuing at ten-day intervals. The cost of each treatment, applying the spray at a pressure of 300 to 400 lb. per sq. in., should not exceed $3 per acre. Spraying operations are facilitated by a wider than normal spacing between the rows.

MILLER (P. A.). **Notes on diseases of ornamental plants in southern California.**—*Plant Dis. Reptr*, xxiv, 11, pp. 219–222, 1940. [Mimeographed.]

In these notes it is stated that prolonged periods of wet weather

during the winters of the past few years probably account for the increased prevalence and severity of cypress canker (*Coryneum cardinale*) [*R.A.M.*, xviii, p. 562] recently noted in southern California. During the past year 14 *Cocos plumosa*, 2 *Phoenix canariensis*, 4 *P. reclinata*, 2 *Washingtonia filifera*, and 3 *Erythea edulis* palms affected by *Penicillium vermoeseni* [ibid., xviii, p. 451] were removed by the park department of Los Angeles. The symptoms on *E. edulis* and *P. reclinata* were typical of the disease as seen on *W. filifera*. Cultures of the fungus were obtained from affected tissues of *P. reclinata*. *Phytophthora citrophthora* from affected crowns of honey locust (*Gleditschia triacanthos*) produced typical brown rot in inoculated lemons. Crown rot lesions on loquat gave cultures of *P. cactorum* [ibid., xvii, p. 399], apparently the first record on this host in the United States. Owing, probably, to a mild, wet winter and a rainy spring, the same host was more widely and severely attacked by *Erwinia amylovora* [ibid., xviii, p. 506] than for many years, some trees suffering almost complete blossom blight, and much twig blight.

During 1939 coast live oak (*Quercus agrifolia*) in the coastal areas of southern California was affected by powdery mildew (*Sphaerotheca lanestris*). The perithecial stage was abundantly present on the leaves of some trees, but hot, dry weather towards the end of September apparently destroyed the conidia, while new growth developing after this hot period was unaffected. In July, 1939, carob trees (*Ceratonia siliqua*) in Riverside County showed typical symptoms of wilt, and pure cultures of a *Verticillium* were isolated from xylem tissues. This is stated to be the first record of the disease on the host in question. *Verticillium* wilt was also observed on a Brazilian pepper tree (*Schinus terebinthifolius*) at Los Angeles, and cultures of *Verticillium* were isolated from woody tissues of coral tree (*Erythrina caffra*) on another estate in the vicinity.

Christensen (C. M.). **Studies on the biology of Valsa sordida and Cytospora chrysosperma.**—*Phytopathology*, xxx, 6, pp. 459–475, 3 figs., 1940.

In the writer's studies at University Farm, St. Paul, Minnesota, the pycnidia and conidia of *Valsa sordida* developed on aspen in the field and in pure cultures on malt agar were indistinguishable from those of *Cytospora chrysosperma* [*R.A.M.*, x, p. 418; xix, p. 171] produced under comparable conditions, neither were there any consistent differences between the isolates of the two stages, though individual variations occurred within each group. Collections of *C. chrysosperma* from hosts other than poplar, i.e., Japanese walnut (*Juglans* sp.) and American elm (*Ulmus americana*), could not be separated from those on aspen and various other species of *Populus* (*P. candicans*, *P. alba* and its varieties *nivea* and *pyramidalis*, and *P. nigra*) on the basis of pycnidial structure, growth rate on agar, and general cultural characters.

C. chrysosperma is a common occupant of the bark of apparently healthy poplars, especially aspen and *P. alba*, and probably also of willow [*Salix*] and mountain ash [? *Pyrus americana*], but the degree of its parasitism on these hosts is regarded as open to doubt. The cankers associated with the presence of the fungus on ornamental poplars may

probably be combated by the development of varieties better adapted to their environment than those now commonly cultivated.

Ahrens (W. E.). **The practicability of detecting Dutch Elm disease by trunk sampling.**—*Phytopathology*, xxx, 6, pp. 521–527, 1 fig., 1940.

A leather punch with a bore ½ in. in diameter, driven into the trunk with a 1 lb. composition rubber mallet, was found to be a suitable implement for use in sampling tests at the Division of Forest Pathology, United States Department of Agriculture, on elms suspected of infection by *Ceratostomella ulmi* [*R.A.M.*, xviii, p. 717]. After a downward thrust to snap off the wood core, the punch was removed from the tree and the wood core ejected with a wooden plunger set in the handle of the mallet. The samples were taken at 6 in. intervals on the circumference of the tree at a convenient height, usually corresponding to the operator's shoulder line, and included wood from not less than two or more than five annual rings. After removal of the outer bark, the samples showing discoloration (with or without slicing) were placed in a glassine bag prior to culturing on potato dextrose agar. The application of wound dressing to the holes from which the samples were taken was made by means of a pump-type oil can.

During the dormant season of 1936–7 this method was applied to 6,031 elms passed as disease-free at the last inspection for foliar symptoms in the preceding summer. The 45 new infections discovered, increasing the total number for the period of the study from 114 to 159, constituted 28·3 per cent. of all those found in the plots by summer scouting and trunk sampling, the latter method being the less expensive of the two. Indications were obtained during the growing season that 80 to 92 per cent. of the infections expressed as foliar symptoms could be confirmed by trunk sampling about a fortnight later. The sampling technique used apparently inflicted no injury on the trees, the growth increment of which was not retarded, while none of the common fungi associated with decay in living trees was isolated from platings of wood adjoining healed or unhealed wounds.

The results of these experiments point to various uses of trunk sampling in relation to Dutch elm disease control, namely, to supplement summer inspections in areas shown by these to be unusually heavily infected; to determine the efficacy of summer scouting by sampling plots selected at random; and to replace summer examinations in wild or semi-wild areas in the vicinity of concentrations of valuable elms.

Campbell (W. A.) & Davidson (R. W.). **Ustulina vulgaris decay in Sugar Maple and other hardwoods.**—*J. For.*, xxxviii, 6, pp. 474–477, 1 fig., 1940.

The black, carbonaceous, crustose fructifications of *Ustulina vulgaris* [*R.A.M.*, xix, p. 49] are stated to be of common occurrence on large stumps and logs of red maple (*Acer rubrum*), sugar maple (*A. saccharum*), and beech in New England, New York, and Pennsylvania [ibid., xviii, p. 356], where the infected substratum is reduced to a mass of thin, dry, brittle, black sheets resistant to weathering and enabling the diseased wood to maintain its shape for many years. In the same region the fungus less frequently occurs as a saprophyte on birch and other trees.

Sugar maple sprouts are readily infected by *U. vulgaris* through the parent stump or the dead stubs of companion sprouts, profuse fructifications appearing both on the decorticated wood of the stubs and on the bark of the adjacent living sprouts. Flattened trunk cankers with the fruiting bodies of the fungus on the face are occasionally observed on red and sugar maples, on which they are apt to develop round infected companion stubs or from the outward penetration of the parasite through the sapwood with the consequent destruction of the cambium. In New England large trunk wounds on roadside maples are frequently infected by *U. vulgaris*, which is also sometimes formed in association with basal injuries, trees invaded in the latter manner often being killed by girdling.

U. vulgaris is fairly common on living beech, fruiting abundantly on flat, cankered areas at the base or on the trunk, as well as on the dead edges of basal injuries. It has also been isolated from butt rot in living paper birch (*Betula papyrifera*), ash (*Fraxinus americana*), and oak (*Quercus* sp.), while one case each of infection of living elm (*Ulmus americana*) and plane (*Platanus* sp.) are on record.

The average incidence of infection by *Ustulina vulgaris* on sugar maple sprouts in four areas of the Green Mountain National Forest, Vermont, was 12 per cent. compared with 68 per cent. for all the fungi concerned in the decay of the trees, the average upward extents of the rot being 57·4 and 44·9 in., respectively. The *Ustulina* decay is typical, consisting of a brittle, white column, having its maximum diameter at the base and tapering sharply upwards to a thin streak, with prominent black zones, arranged in irregular patterns through and around it.

In view of the relatively small number of potential saw timber trees likely to contract infection by *U. vulgaris*, specific control measures would not appear to be justified.

JENKINS (ANNA E.) & RAY (W. W.). **A new host for Taphrina dearnessii and geographic distribution of Taphrina on North American Maples.**—*Mycologia*, xxxii, 3, pp. 408–414, 3 figs., 1 map, 1940.

A species of *Taphrina* found on mountain maple (*Acer spicetum*) causing a certain amount of wrinkling and blighting of the affected leaves near Ithaca, New York, in June, 1937, was determined as *T. dearnessii*, recently described on red maple (*A. rubrum*) from Canada and the United States [*R.A.M.*, xviii, p. 718]. In the *Taphrina* group on North American maples [cf. ibid., xix, p. 495] this is the second instance of one species infecting two different hosts. The present known distribution of *Taphrina* on maples in North America is shown on a map.

MOOK (P. V.). **Three new locations for the Sycamore (Plane-tree) disease.**—*Plant Dis. Reptr*, xxiv, 10, pp. 205–206, 1940. [Mimeographed.]

The *Ceratostomella* disease [*R.A.M.*, xv, p. 329] is reported for the first time from Kentucky and Tennessee on *Platanus occidentalis*, and from a new locality in Delaware on *P. acerifolia*. In the last-named case a number of trees have already died.

FORBES (A. P. S.). **Some Tung Oil diseases in Nyasaland.**—*Nyasald Tea Ass. quart. J.*, iv, 4, pp. 6–10, 1940.

Notes are given on diseases of tung oil (*Aleurites* spp.) trees in Nyasa-

land. Leaf spot (*Glomerella cingulata*) is present on most estates. This disease takes the form of an irregular, yellowish green spot which, as it enlarges, becomes reddish-brown, with an indistinct yellowish margin. Old spots are greyish, with black dots in the centre, and in the final stages the affected tissue is ragged and broken. As a rule only the old leaves of healthy trees are affected. The disease appears, however, on young trees planted in an unsuitable environment, in which case it aggravates their condition; if weeds are allowed to grow near the trees, forming a humid atmosphere, the lower leaves are always attacked.

Die-back due to *Colletotrichum gloeosporioides* [by some regarded as the conidial stage of *G. cingulata*] is usually associated with twig or branch die-back due to mechanical injury, but unsatisfactory environmental conditions seem to predispose the trees to infection by this fungus, especially if the atmospheric humidity becomes too high. It is recommended that in cases of die-back the branch should be cut off at least 9 in. below the affected part nearest the trunk, and the cut surface tarred.

An unusual die-back of *A. fordii* seedlings has occurred on several estates. The plants are unthrifty, and show the presence of scale and lichen. The roots develop, but stem growth is retarded. Finally, the bark cracks at the collar, by which time leaves have begun to turn yellowish-brown and fall. The tree may or may not regenerate itself by the development of dormant buds below this region. The evidence indicates that the condition is non-parasitic; it has occurred only on seedlings planted in the dry season and is most prevalent in eroded areas. Affected seedlings should be cut back to the collar and the wound tarred.

The most important disease affecting tung trees locally is collar crack (*Armillaria mellea*), which is present in the virgin forest but causes little damage until the forest is removed, and the tung roots come into contact with those of decaying indigenous trees, when the tung trees are eventually killed. For purposes of control, trees and shrubs on all land to be opened up should be ring-barked at least 18 months before commencing planting operations [cf. *R.A.M.*, xvi, p. 564], and at intervals shoots developing below the ringed portion removed.

Ustulina zonata was twice found on dead tung trees under conditions which suggested that it was responsible for their death [ibid., xiii, p. 78].

A new disease was observed, in which the trees or seedlings passed through a process of degeneration sometimes resulting in the death of the terminal bud and of isolated patches of tissue on the stem. The leaves developed chlorosis and the veins remained green and prominent; the internodes were shortened and the leaves dwarfed and distorted. The shoot rapidly became thin and developed closely crowded nodes. Meantime, all the leaves formed before and after the condition appeared, except the youngest, dropped off, the death of the terminal bud being followed by a general die-back.

WOLF (F. A.). **A leafspot fungus on Nyssa.**—*Mycologia*, xxxii, 3, pp. 331–335, 1940.

Morphological studies of the fungus associated with leaf spot of *Nyssa sylvatica* and *N. biflora* in the south-eastern United States, and com-

monly identified as *Phyllosticta nyssae* Cooke, showed that it is a spermogonial stage with spermatia 3 to 3·5 by 1 to 1·5 μ, genetically connected with an ascigerous stage growing on decaying leaves and reaching maturity the following spring. Both spermogonia and perithecial primordia are found from August until October. By late March or early April the stromata have developed into mature perithecia 60 to 85 μ in diameter, globular except for a short ostiolar papilla projecting above the leaf surface. The cylindrical-clavate asci measure 25 to 30 by 6 to 7 μ, and the hyaline, uniseptate ascospores 8 to 10 by 3·5 to 4·5 μ, with the upper cell broader than the lower one. This ascigerous stage, originally described as *Sphaerella nyssaecola,* is renamed *Mycosphaerella nyssaecola* (Cooke) n. comb.

WATERMAN (ALMA M.) & ALDRICH (K. F.). **Rehmiellopsis needle blight of Balsam Fir in Maine.**—*Plant Dis. Reptr*, xxiv, 10, pp. 201–205, 1 map, 1940. [Mimeographed.]

The results of inspections made in 1936, 1938, and 1939 showed that an area covering roughly 15 localities (round the Moosehead Lake and to the south-west of it) in western Maine, was affected by the needle blight of balsam fir [*Abies balsamea*] caused by *Rehmiellopsis bohemica* [*R.A.M.*, xvi, p. 786]. Young trees in the dense growth about 150 to 200 ft. from the road were as severely infected as those growing exposed along the roads. The disease is gradually killing trees of all sizes, but particularly the seedlings.

CARTWRIGHT (K. ST. G.). **Note on a heart rot of Oak trees caused by Polyporus frondosus Fr.**—*Forestry,* xiv, 1, pp. 38–41, 1 pl., 3 figs., 1940.

During a visit to the Forest of Dean in 1938 the author observed a white heart rot in the butt ends and stumps of two freshly felled oak trees. Cultures of decayed wood yielded *Polyporus frondosus*, which has not been previously recorded in England on living oak trees. The rot was of a type similar to that caused by *Stereum frustulosum* [*R.A.M.*, xix, p. 246], but the white pockets of rot were less pronounced, and in an advanced stage the decay was more stringy. In a less advanced stage the decayed area tended to be outlined by a water-soaked, reddish zone, and orange zone lines were present in some portions. In all probability the rot spreads upwards in the log, infection starting from the root.

In sections of oak wood gumming was present in certain areas, and the fine, hyaline hyphae, with simple, inconspicuous clamps, tended to be coloured by the gum. Penetration occurs through the walls of the wood, but more often through the pits. In an advanced stage of decay the lignified elements are attacked and the cellulose components hydrolysed.

On 2 or 5 per cent. malt agar mycelial growth is slow in the dark, and arrested or considerably retarded in the light. The mycelium is at first almost colourless; later, on 5 per cent. agar, a white, woolly to felty mat is produced, which becomes patched with colour, ranging from maize-yellow through light cinnamon-buff to antimony-yellow (Ridgway), especially in cultures grown in light. The mature mat is moderately smooth, tough like kid leather, and exudes yellow drops of liquid.

Fruiting is fairly frequent. The basidia, each with four sterigmata, measure up to 30 by 8 μ, and the basidiospores 5 to 6 by 3·5 to 4·5 μ; each spore has an obliquely placed apiculus. Secondary spores, which are both terminal and intercalary and very variable in size (20 by 15 μ up to 50 μ), are produced abundantly both on the aerial and the submerged mycelium. The mycelium gives a strong oxidase reaction when tested with gum and guaiacum mixture.

OFFORD (H. R.), VAN ATTA (G. R.), & SWANSON (H. E.). **Chemical and mechanical methods of Ribes eradication in the White Pine areas of the Western States.**—*Tech. Bull. U.S. Dep. Agric.* 692, 50 pp., 11 pl., 1 map, 1 graph, 1940.

A full account is given of chemical and mechanical methods developed for the eradication of *Ribes* spp. in areas where hand-pulling and grubbing are ineffective and expensive, as part of the campaign against *Cronartium ribicola* which, in the western areas of the United States, threatens some five million acres of *Pinus monticola* and *P. lambertiana*.

For the eradication of *R. petiolare* atlacide (essentially a mixture of sodium chlorate and calcium chloride) is applied at the rate of 960 lb. per acre.

Investigations of the fire hazards of sodium chlorate under forest conditions showed that hygroscopic mixtures, such as sodium chlorate and calcium chloride, or mixtures containing a non-combustible filler, such as sodium bicarbonate or borax, are safer than sodium chlorate alone.

Ammonium thiocyanate and sodium chlorate were the most effective chemicals tested for killing *R. inerme*, but are recommended only for areas where destruction by mechanical means (the 'bulldozer' machine) [*R.A.M.*, xix, p. 176] is impracticable. The most economical method of eradicating this species by chemical products is to spray first with the dosage of maximum efficiency (2,160 lb. per acre ammonium thiocyanate or 2,346 lb. sodium chlorate), which gives about 81 per cent. bush kill, and a year later to treat the surviving bushes with a practical lethal dosage of 4,000 lb. or 4,600 lb., respectively.

A method involving decapitation and chemical treatment has been applied successfully to large or troublesome *Ribes* of the individual bush type. About 1 oz. of liquid or dry chemical is used for a crown some 2 in. in diameter, the dosage being increased proportionately for larger crowns. Diesel oil is used on *R. cereum* and *R. roezli*, a mixture of dry sodium chlorate and borax (1:5) on *R. viscosissimum*, and dry sodium thiocyanate or a saturated solution of ammonium thiocyanate on *R. bracteosum*. Preliminary chemical studies indicated that *R. erythrocarpum* can be inexpensively eradicated with atlacide spray (960 lb. per acre), while *R. bracteosum*, *R. irrigrum*, *R. lobbii*, *R. nevadense*, *R. sanguineum*, *R. triste*, and *R. watsonianum* require to be killed off by the decapitation technique.

Occasional areas of dense brush and *R. inerme* may be permanently suppressed by the bulldozer machine, a special type of which has been devised. With this machine all *Ribes* and bush are uprooted and pushed into long windrows. Hand-slashing of brush in conjunction with hand-pulling of *Ribes* has also been employed for clearing such areas,

where labour costs are low. In both cases the brush is burned and the cleared area planted to grass. The average costs per acre for the eradication of *R. inerme* by the bulldozer method, slashing, and chemical treatment are, respectively, $49, 58, and 96.

CHIDESTER (MAE S.). **A pink stain of wood caused by a species of Geotrichum.**—*Phytopathology*, xxx, 6, pp. 530–533, 1 pl., 1940.

A mould isolated from jasper-pink- or light jasper-red-stained sap- and heartwood of southern yellow pine [*Pinus* spp.] timber from New Orleans was characterized on malt extract agar at 25° C. by mealy colonies composed of clumps of ivory to baryta-yellow (hyaline at maturity), concatenate conidia, 2·7 to 4·1 by 2 to 3·6 μ, borne on irregularly and profusely branched conidiophores. A pinkish tinge is imparted to the medium, and the mycelium turns dark brown in some places and Tyrian blue in others. The organism was referred by W. W. Diehl to the genus *Geotrichum*, of which it is thought to be probably a new species. The same fungus has been isolated by the writer from red-stained cypress [? *Taxodium distichum*] heartwood, and by R. W. Davidson from the heartwood of a rotting oak log. The colour of the stain in the New Orleans pine wood was quite distinct from that of 'red heart' (the incipient stage of infection by *Fomes pini*), which was also present. A discoloration identical with that observed in pine was induced by inoculating the pink-staining fungus into sap- and heartwood sticks (first steamed for 30 minutes at atmospheric pressure) of silver fir (*Abies amabilis*), yellow birch (*Betula lutea*), black spruce (*Picea mariana*), loblolly pine (*Pinus taeda*), Douglas fir (*Pseudotsuga taxifolia*), red oak (*Quercus borealis*), southern cypress (*T. distichum*), and western hemlock (*Tsuga heterophylla*), those with a moisture content of 90 to 100 per cent. being more intensely and uniformly stained than those with a lower one (40 to 50).

LOHMAN (M. L.) & CASH (EDITH K.). **Atropellis species from Pine cankers in the United States.**—*J. Wash. Acad. Sci.*, xxx, 6, pp. 255–262, 2 figs., 1940.

The genus *Atropellis* is revised to include, besides *A. pinicola*, the agent of branch or stem cankers of several kinds of pine in the Pacific Northwest and California [*R.A.M.*, xv, p. 117], two new species, *A. tingens* and *A. arizonica* [with Latin diagnoses], the former observed on the twigs, branches, and small stems of *Pinus banksiana*, *P. caribaea*, *P. clausa*, *P. densiflora*, *P. echinata*, *P. nigra*, *P. pinaster*, *P. pungens*, *P. resinosa*, *P. rigida* and its var. *serotina*, *P. strobus* (occasional, in Virginia only), *P. taeda*, and *P. virginiana* in the eastern half of the United States, and the latter on *P. ponderosa* stems in Arizona. *Cenangium piniphilum* [loc. cit.] on *P. banksiana*, *P. contorta*, *P. jeffreyi*, *P. ponderosa*, *P. taeda*, *P. albicaulis*, *P. monticola*, and *P. virginiana* is renamed *A. piniphila* (Weir) comb. nov.

The *A.* cankers of the United States differ from those associated with the allied genus *Crumenula* in Europe [ibid., xvi, p. 136] in their furfuraceous exciples, stellate or irregularly lacerate apertures, and blue-black epithecia, as well as in the type of canker produced and the

characteristic discoloration of the host tissue by the mycelium (a localized dark stain in the American material examined).

Crowell (I. H.). **Heart bluestain of White Spruce and Balsam Fir.**—*Pulp Pap.* (*Mag.*) *Can.*, xli, 7, pp. 451–452, 5 figs., 1940.

Blue stain of conifer heartwood (as distinct from the sapwood) is stated to be almost unknown, but the author recently received from Shelter Bay, Quebec, specimens of white spruce (*Picea canadensis*) and balsam fir (*Abies balsamea*) in which practically the entire heartwood was penetrated by a roughly circular, deep blue stain, leaving the sapwood free. Many short, blackish lines extended continuously from the radial to the tangential surface and were identified as fungal hyphae developing in small plates of tissue in a transverse or horizontal plane. The dark olivaceous, septate, cottony hyphae slowly emerging from the stained areas of wood blocks in a moist chamber remained completely sterile for five weeks, thereby precluding any possibility of identification for the time being. No rotting or disintegration of the discoloured wood could be detected. The only other report of blue stain of heartwood known to the author refers to a single slow-growing spruce in Norway, in which the bluish-grey discoloration was confined to a very small area just above soil-level, where it tapered to a fine point.

Birkinshaw (J. H.), Findlay (W. P. K.), & Webb (R. A.). **Biochemistry of the wood-rotting fungi. 2. A study of the acids produced by Coniophora cerebella.**—*Bio-chem. J.*, xxxiv, 6, pp. 906–916, 1940.

The amount of acid produced by *Coniophora cerebella* [*C. puteana*], both in malt solution and on Scots pine [*Pinus sylvestris*] sapwood, being substantially larger than that derived from any of the other wood-destroying fungi tested, the organism in question was selected for closer investigation (within the framework of the series of studies on fungal biochemistry now in progress [*R.A.M.*, xix, p. 448]).

The acidic products formed by *C. puteana* (Idaweiche strain) [ibid., xviii, p. 829] after incubation periods of two, four, and six months were identified as formic, acetic, traces of oxalic, and relatively large quantities, equivalent to about one-third of the total titratable acidity after the two longer incubation periods, of citric acid, isolated as the methyl ester. Other acids of higher molecular weight, believed from the results of qualitative tests to be hexuronic, were also present. Volatile acids, including formic, were also found to occur in sound wood, in amounts comparable with those recorded for the decayed samples, and cannot, therefore, be regarded as metabolic products of the fungus. Citric acid, on the other hand, occupies an entirely different position, being a true metabolic product of the growth of *C. puteana* on pine wood.

Riley (C. G.). **Deterioration in piled pulpwood.**—*Pulp Pap.* (*Mag.*) *Can.*, xli, 7, p. 450, 1940.

In an experiment started in 1932 in the Gatineau drainage basin of Quebec by the Dominion Forest Pathological Service with the co-operation of the Canadian International Paper Company, the rate of decay in piled pulpwood was studied in relation to (1) species of wood, (2) peeling, (3) conditions of site, and (4) season of cutting. Black and

white spruce [*Picea mariana* and *P. glauca*], balsam [*Abies balsamea*], and Jack pine [*Pinus banksiana*] of commercial sizes were cut into 4-ft. lengths and piled separately on skids, one half of each pile being peeled and the other left with the bark on. Four sets of duplicate piles, one in a dry, open field, and the other in swampy ground, were established in early September, mid-October, early December, and June. Annual inspections showed that in all the piles the peeled considerably outlasted the unpeeled wood, but decortication was accompanied in the June and September piles in the open site by the unpleasant feature of excessive cracking, due to rapid drying of the wood. Peeling acted as a strong deterrent of blue and red stain in black spruce, but failed to prevent these defects in *P. banksiana*, which decayed rapidly under all circumstances. All the other woods remained in better condition on the dry than on the damp site.

STARKER (T. J.). **Preservative treatments of fence posts: 1938 progress report on the post farm.**—*Bull. Ser. Ore. Engng Exp. Sta.* 9, 21 pp., 3 figs., 1 diag., 1 graph, 1938. [Received May, 1940.]

The 'post farm', established in 1927 at the School of Forestry, Oregon State College, 'is a plot of ground of uniform character selected to determine the lasting qualities of different species of wood and different preservative treatments when in contact with the soil'. Annual examinations of the treated posts have been made since 1932, their condition being ascertained by the application of a 50 lb. pull 2 ft. from the ground with a spring balance attached to a loop of wire round the post. The following are some of the data from the 47 series included in the experiments. None of the 25 second-growth Douglas fir [*Pseudotsuga taxifolia*] posts (25 years old) treated with one tablespoon of mercuric chloride and common salt in one $\frac{3}{4}$ in. hole bored at ground line had failed at the date of the last inspection (1938), whereas the controls of the same age and origin were all rotted, their average life having been only 84 months. Entirely satisfactory results with Douglas fir were also given by the same treatment with the addition of arsenic introduced through two or three holes; Anaconda Copper Company treater dust and paste, the latter applied at 2 or 4 lb. per post; a mixture of 70 per cent. creosote and 30 per cent. fuel oil, $1\frac{1}{2}$ to 16 lb. absorption (posts set up in 1929), and Z[inc] M[eta] A[rsenite: *R.A.M.*, xv, p. 486], average retention 0·207 lb. per cu. ft. The tops of white cedar [?*Thuja occidentalis*] poles given an open-tank treatment in 1928 by the Carbolineum Wood Preserving Company, Springfield, Oregon, involving four hours' immersion in hot oil (225° to 230° F.), followed by a bath in oil at not less than 150°, were still sound at the last inspection, as were likewise 25 western hemlock [*Tsuga heterophylla*] vacuum-pressure-treated with thanalith, securing 0·302 lb. retention per cu. ft.

Data from five series of posts removed *en bloc* clearly demonstrated the unsuitability for permanent fence lines in an untreated state of cottonwood [*Populus* spp.], alder, madrone [*Arbutus menziesii*], and big-leaf maple [*Acer macrophyllum*], which failed after 55, 69, 69·6, and 76 months, respectively, besides Douglas fir, referred to above.

Appendices A, B, and C describe, respectively, the wood requirements for farm fences, the above-mentioned mercuric chloride-arsenic-

salt treatment, and the open-tank process, usually applied with coal tar creosote.

MÖRATH (E.). **Practical results in the preservation of wooden telegraph and transmission poles.**—35 pp., 8 figs., 1 graph, International Advisory Office on Wood Preservation, Oranjestraat 9, The Hague, Holland, 1939.

In this interesting booklet are given data regarding the position of wood preservation in 17 European countries compiled on the basis of replies to a questionnaire circulated to the telegraph and telephone authorities and those of large power stations by the International Advisory Office on Wood Preservation. Some of the data have already been summarized from another source [*R.A.M.*, xix, p. 447], but it may be mentioned that the principal North American telegraph companies estimate the average life span of creosoted poles at 50 years, doubtless owing to the heavier absorption generally prescribed (125 or even up to 190 kg. per cu. m. = 7·7 to 11·8 lb. per cu. ft.) as compared with normal European practice. It is apparent that up to the present creosote is much the most reliable preservative available, and hence its consumption exceeds that of all the others together [ibid., xvii, p. 426; xviii, p. 656 *et passim*].

STEWART (D.). **The use of treated wooden poles in India for electric distribution and service.**—*Indian For.*, lxvi, 3, pp. 146–154, 1940.

Summing up the position in India with regard to the preservation of wooden poles in relation to Mörath's international survey of the methods adopted in European countries [see preceding abstract], the writer draws attention to the extremely exacting conditions prevailing in India both in respect of climate and abundance of wood-destroying fungi. Data based on experience with a total of 17,000 poles showed that those treated with coal tar creosote and fuel oil (50:50) are still in good condition to date after 3 to 8 years' service but that unsatisfactory results were obtained with a mixture containing wood tar creosote and coal tar creosote and with a new water-soluble preservative. It is evident, therefore, that the difficulties (mainly of cost and convenience) connected with the application of the invaluable standard creosote treatment will have to be overcome in order to avoid further waste of material. For Indian conditions a minimum absorption of 10 lb. creosote plus 5 lb. fuel oil will no doubt be essential.

THOMAS (A. V.). **Experiments with impregnated pit props.**—*Malay. Forester*, ix, 2, pp. 74–77, 1940.

Notes are given on three experiments in the preservation of pit props (of species not botanically identified) carried out in the mines of Malayan Collieries Ltd. A number of the props treated in 1930 by the Lowry process [*R.A.M.*, xvii, p. 2] with 25 per cent. creosote and 75 per cent. Diesel fuel at a pressure of 120 lb. per sq. in., built up in 30 minutes and held for 25, absorption per cu. ft. ranging from 1·7 to 9·9 lb., were still in good condition after 2½ years, whereas most of the untreated had to be replaced twice during the first 18 months of the experimental period. All the material impregnated in 1933 with equal parts of creosote and

Diesel fuel, each end of the butt being immersed in the preservative for four hours at 200° F. and cooled off for 16¼ hours, absorption 2 to 7·5 lb. per cu. ft., was still sound after 67 months, compared with an average life for the untreated of 45. In another test in 1933 with the same proportions of creosote and fuel, all were in good condition after 2 years and 4 months [cf. preceding and next abstracts].

HARDY (E.). **Pit-prop fungi.**—*Colliery Engng*, xvii, 195, pp. 116–117, 1 fig., 1940.

The most common agents of pit-prop decay in British mines are stated to be *Merulius lacrymans*, *Poria vaporaria* [*P. vaillantii*], and *Coniophora cerebella* [*C. puteana*: *R.A.M.*, xviii, p. 361 *et passim*], simple descriptions of which are given as aids to identification. *Lenzites sepiaria* is also apt to be troublesome, especially on pine wood, but unlike *M. lacrymans*, it cannot attack hardwoods. Under excessively warm and humid conditions *Fomes annosus* is the chief cause of decay in pine and other soft woods, while *Polystictus versicolor* is found on oak and other hardwoods. Waterlogged props of any sort are subject to infection by *Armillaria mellea*, the advance of which may be so rapid as to necessitate renewal of the wood within six months. *M. lacrymans* may be controlled with creosote (also effective against *A. mellea*), tar, boric acid, or the dinitrocresates of potassium or sodium.

PABLO. **Träimpregnering med arseniksalter.** [Timber impregnation with arsenic salts.]—*Skogen*, xxvii, 5, pp. 101–104, 6 figs., 1 diag., 1940.

A description is given of the technical aspects of the process of timber preservation by means of impregnation with a solution of arsenic acid, disodium hydrogen arsenate, sodium bichromate, and zinc sulphate, which is successfully employed at the Boliden Mining Company's works in Sweden [*R.A.M.*, xvi, p. 649; cf. also xviii, p. 220]. The substances are combined in certain proportions, and a chemical reaction takes place in the treated wood resulting in the formation of zinc hydrogen arsenate and chromium arsenate, which are precipitated and become insolubly fixed in the wood. These two salts are the active agents in protection and it is essential for the efficacy of the treatment that the arsenic content should not fall below the equivalent of 0·1 per cent. arsenic pentoxide. The wood is subjected to 12 hours' low-pressure vaporization prior to immersion for 24 hours in a cold bath of the chemical disinfectant, of which 250 kg. is absorbed by each cu. m. of pine wood, allowing for a penetration of 1 per cent. arsenic pentoxide into the sapwood at the normal strength of the mixture.

RENNERFELT (E.). **Investigations of damages caused by fungi in wet mechanical wood-pulp.**—*World's Pap. Tr. Rev.*, Tech. Suppl., cxii, 24, pp. 169–175, 1939; cxiii, 2, pp. 1–3, 8 figs., 1940.

Some of the information presented in this useful survey of investigations by the writer and others on fungal damage to wood pulp [see next abstract] in Sweden has been noticed from other sources [*R.A.M.*, xix, p. 250 *et passim*], but the following points may be mentioned. Of the four principal sources of infection, viz., the wood, the fresh water, the mill air, and the white water or circulating system of the mill, the

second is of most importance in mills constructed on the old-fashioned open system, which use about 10,000 l. fresh water per minute. An examination of fresh pulp revealed 10 per cent. infection originating in the fresh water as compared with under 1 per cent. in material produced in mills with closed systems using 1,000 l. or less per minute. Generally speaking, mill air is not a major contributory factor to the fungal infection of pulp, being responsible, according to the writer's calculations, for not more than 0·1 per cent. The blueing fungi (*Phialophora fastigiata*, *Pullularia pullulans*, and under certain conditions *Ceratostomella piceae*) and moulds (*Aspergillus*, *Oidiodendron*, *Penicillium*, and *Trichoderma* spp.) on the spruce wood are largely killed off by the high temperature developing during the grinding process, so that newly ground pulp is practically sterile. In open-system mills, where the temperature of the white water is only slightly higher than that of the fresh water (25° C. in summer and 5° to 10° in winter), the average incidence of infection, chiefly by *Geotrichum candidum* and other Torulopsideae, averages only 100 to 300 spores per c.c., whereas in closed systems the numbers are much larger (300 to 1,200) at relatively low temperatures (not exceeding 40°) but fall practically to zero at 55° to 60°: here again the Torulopsideae predominate, being 5 to 16 times more frequent than the other organisms under discussion. The pulp is infected in such a way that 10 to 40 per cent. of the spores in the white water are filtered away at the same time as the fibres on the kamyr machine. A large number of the spores in the white water do not find their way into the pulp, but return to the system.

Conditions in the pulp are more favourable to the development of moulds, the blueing fungi, and [unspecified] agents of 'brown' and 'dry' rot than to the growth of the Torulopsideae, and during storage the number of spores belonging to organisms of one or other of these groups may increase to 1,000,000 per gm.

Of the various chemicals so far tested for the control of fungal infection in paper mills, borax and sodium fluoride are effective against decay but tend to stimulate the growth of moulds, especially *Penicillium* spp., a similar activating effect on which is produced by sulphurous acid. In addition to disinfectants previously reported on, pulpasan has given very promising results in a couple of mills. Like lignasan, this preparation contains 6 per cent. ethyl mercury chloride and is used at a rate of 200 gm. per ton wet pulp. Certain species of *Penicillium* are very resistant even to this powerful fungicide, but the difference between treated and untreated material is striking, and no deleterious action is exerted by the infinitesimal amount of mercury remaining in the pulp after washing.

NASON (H. K.), SHUMARD (R. S.), & FLEMING (J. D.). **Microbiology of pulp and white water systems.**—*Paper Tr. J.*, Tappi Sect., cx, 13, pp. 30–36, 10 figs., 1940.

Most of the common wood-destroying fungi are stated by Kress *et al.* [*R.A.M.*, iv, p. 645] to be involved in the causation of damage to mechanical pulp in American paper mills. Most of the staining fungi reported from Scandinavia [see preceding abstract] have also been detected on damaged pulp in the United States or Canada. Some of these,

mostly belonging to the group of common moulds, e.g., *Penicillium* spp. and *Aspergillus niger*, produce stains that wash out in the beater and do not affect the finished sheet; while a species of *Haplographium* forms a heavy, black, sooty growth on the surface of the lap which is completely eliminated in the beaters. Other staining organisms are more troublesome, producing hard, brown or black specks extending through the pulp lap and persisting right through the beating process to the finished sheet. To this class belongs, for instance, *Cadophora* [*Phialophora*] *richardsiae* [ibid., xvii, p. 178; xviii, p. 362], isolated from specked Wisconsin groundwood pulp.

One of the most suitable and effective fungicides for the cleansing of paper mill systems is sodium pentachlorophenate, the incorporation of which with the pulp (sprayed on the lap during formation on the wet machine) at the rate of 2 to 4 lb. per ton will prevent rotting, discoloration, and specking during damp storage. The same compound may be used with advantage for the mildew-proofing of paper and boxboard at concentrations of 0·06 to 0·5 per cent. of the weight of the moisture-free fibre; for the preservation of felts against biological rotting (in a weak solution); and for the prevention of souring or putrefaction of stocks in process held over during the shut-down period (5 lb. per ton).

BECKWITH (T. D.), SWANSON (W. H.), & IIAMS (T. M.). **Deterioration of paper : the cause and effect of foxing.**—*Publ. Univ. Calif., biol. Sci.* i, 13, pp. 299–356, 9 pl., 1940.

The form of paper deterioration known as 'foxing', characterized by the production of rusty-red areas over the surface, has been found not to be primarily due to chromogenesis by fungi, although the pigments secreted by the latter may contribute to the development of the defect and both fungi and 'foxing' are most prevalent on substrata with an acid reaction. The iron commonly occurring in the ferric state in paper also favours mould growth, which is further stimulated by certain sizings and fillers, such as starch, dextrin, and gelatine. Little or no fungal growth is made in an atmosphere of less than 75 per cent. relative humidity. The presence in paper of living or dead hyphae, as well as of some of the degradation products of cellulose, may be histologically demonstrated by the application of certain staining methods involving the use of (*a*) safranin and aniline blue, (*b*) Pianese IIIb, (*c*) Victoria blue, and (*d*) iodine and potassium iodide. Of the species of *Alternaria*, *Monilia* [? *Candida*], *Aspergillus*, *Penicillium*, *Mucor*, *Stemphylium*, *Hormodendrum*, *Fusarium*, *Chaetomium* [cf. *R.A.M.*, xviii, p. 696], and *Byssochlamys* isolated from old materials in the Huntington Library of the University of California (*Aspergillus* and *Penicillium* predominating), pigmentation was produced in cellulose broth at room temperature only by the green and blue species of *P.* [*P. digitatum* and *P. italicum*, respectively], a grey *P.*, and a species of *H.*, the colours associated with which were dark greenish-yellow to light brown, yellow, brownish-yellow, and dark green, respectively. Attempts to combat fungal deterioration by chemical treatments [cf. ibid., xix, p. 317] gave somewhat disappointing results, since the compounds toxic to the pathogens, e.g., 1 per cent. mercuric chloride, 1·5 per cent. mercuric salicylate, 1 per cent. tribrombetanaphthol, 2 per cent. orthocresol, and

1 per cent. mercuric benzoate, likewise tended to induce undesirable changes in the paper.

Okamoto (H.). **On the relation of root pests to black rot of Sweet Potato root-tuber in the field.**—*Ann. phytopath. Soc. Japan*, x, 1, pp. 27–35, 2 figs., 1940. [Japanese, with English summary.]

The black rot fungus (*Endoconidiophora* [*Ceratostomella*] *fimbriata*) was observed to enter sweet potato tubers [*R.A.M.*, xvii, p. 506] in the field mostly through cavities made by the feeding of various insect pests, e.g., *Cylas formicarius* and *Colasposoma oberthüri* in the Okinawa-honto district of Japan. The longer the time elapsing after feeding, the more difficult it is for the pathogen to gain ingress through these channels. The extermination of the pests in question is therefore an important means of combating *Ceratostomella fimbriata.*

Crosier (W.) & Patrick (S.). **Influence of chemical and thermal treatments on infection of cruciferous seedlings by Alternaria spp. and Rhizopus nigricans.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1939,* pp. 116–120, 2 figs., 1940.

In seed disinfectant tests with cruciferous hosts carried out at Geneva, New York, in 1938, a soak of 25 minutes in hot water (50° C.) or a dip in a 0·2 per cent. suspension of new ceresan increased the percentage of germinating seeds of Copenhagen cabbage from 64 to 76 and 80, respectively, with only 3 and 5 per cent., respectively, of the sprouts being infected by the pod spot organisms, *Alternaria brassicae* and *A. circinans* [*R.A.M.*, xviii, p. 495], and the common black mould *Rhizopus nigricans*, as compared with 63 per cent. in the untreated control. In tests with other disinfectants, applied as dips and dusts to cabbage, radish, and broccoli seeds, mercurial materials compared favourably with hot-water treatments, while oxides of copper and zinc were noticeably less effective. It is concluded that when control of fungi alone is desired, the mercurial dusts possess advantages over the other materials, provided the seeds were well covered with dust and all the non-adhering excess is removed. Consistently satisfactory results were obtained with barbak C. [ibid., xviii, p. 787], an organic mercurial compound, which yielded on the average 8·2 per cent. more normal sprouts than any of the other mercurial dusts.

Porter (R. H.) & Rice (W. N.). **Laboratory and field germination of treated and untreated Beet seed.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1939,* pp. 127–130, 1940.

In laboratory tests at Ames, Iowa, in 1936, with beet seed-clusters which harboured infection with *Phoma betae* [*R.A.M.*, xix, pp. 132, 319], seed treated with 1 per cent. ethylmercury phosphate prior to planting in autoclaved soil yielded an average of 266·7 normal seedlings and 7·3 diseased ones from 100 seed-balls compared with 157 and 24·7, respectively for untreated seed. When planted in blotters, sand, or soil untreated seed produced approximately the same number of healthy seedlings, and the data obtained with treated seed seem to indicate that *P. betae* prevented the germination of many untreated seed-clusters in blotters and the emergence of many in both sand and soil.

In comparative tests carried out during 1938–9 treatment of garden beet, mangel, and sugar beet seed with 1 or 5 per cent. ethylmercury phosphate or semesan had a beneficial effect on the emergence of seedlings in the field, but made little difference in the laboratory. The mean figures for all three crops in the field showed an increase of nearly 70 per cent. in the number of seedlings raised from seed treated with 5 per cent. ethylmercury phosphate over the untreated control. The results indicate that garden beet and mangel respond to treatment in a similar manner to sugar beet and that infection by *P. betae* of *Beta* spp. may be largely controlled by seed disinfection.

Young (H. C.). **Soil conditions affecting Sugar Beets.**—*Sug. Beet J.*, v, 7, pp. 127–129, 137–138, 1940. [Abs. in *Facts ab. Sug.*, xxxv, 7, p. 36, 1940.]

In a soil temperature experiment [in the United States] involving the use of greenhouse tanks regulated to six different temperatures between 54° and 89° F. and kept very or slightly dry and very or slightly wet, the lowest incidence of black root [*R.A.M.*, xvii, p. 506] and the best beets developed at 54° and 61° in the slightly dry and slightly wet soils. Seedling diseases in general are much less prevalent in light, well-aerated soils than in heavy ones: the incorporation of peat and muck in a medium-heavy soil led to a substantial decrease of damping-off [*Pythium de Baryanum*, *Corticium solani*, and other organisms], good control of which has also been obtained by seed treatment with ceresan [ibid., xix, p. 131] or red copper oxide.

Watson (M[arion] A.). **Studies on the transmission of Sugar-beet yellows virus by the aphis, Myzus persicae (Sulz.).**—*Proc. roy. Soc.*, Ser. B., cxxviii, 853, pp. 535–552, 1940.

In studies on the vector—virus relationship of the sugar-beet yellows virus [*R.A.M.*, xviii, p. 429] conducted at Rothamsted, the author used the virus propagated from material received from Prof. Quanjer, Wageningen, the symptoms produced by which were similar to mild strains of the virus obtained from leaves collected in four counties in England, whereas strains from Rothamsted and Hornsea (Yorks) were more virulent, causing vein-clearing of medium-aged leaves and local symptoms on older ones. The experiments were designed to test the efficiency of the vector, *Myzus persicae*, in transmitting the virus from infected to healthy plants after varying times of feeding. The infectivity of the vector was found to increase greatly with increasing feeding time on the infected and on the healthy plant, infections after feedings of 2 minutes, 1 hour, and 18 hours on infected plants being 0, 11, and 69 per cent., respectively, and after feedings of 20, 30, 40, 90, and 180 minutes on healthy plants following constant infection feeding of 18 hours, 17, 23, 31, 58, and 61 per cent., respectively. When fed on two consecutive healthy plants the amount of infection obtained on the second decreased with increasing time of feeding on the first healthy plant. Infections were produced in a succession of healthy plants for one, two, and three days. There was no indication of a definite 'incubation period' of the virus in the vector, below which no infectivity could

be obtained. The virus of sugar beet yellows is thus different from the non-persistent viruses [ibid., xix, p. 562] which cease to be infective within a few hours of removal of the vector from the infected plant. A comparison with the sugar beet curly top virus [ibid., xix, p. 250] seems to indicate that with neither virus is there a period after feeding on infected plants during which the vectors are unable to transmit the virus but merely a period of increasing infectivity towards a maximum at which all insects capable of transmitting it will do so. It is suggested that the behaviour of the virus in response to varying feeding times on both infected and healthy plants can be explained on a purely quantitative basis by assuming that the amount of virus taken up by the vector increases with the time of feeding on the infected plant. It is possible that effective transmission of the virus is delayed, for it may be that time is required for the virus to circulate through the body of the vector, and this would account for the increased infectivity of vectors with prolonged feeding times on the healthy plants.

ZAUMEYER (W. J.). **Three previously undescribed mosaic diseases of Pea.** —*J. agric. Res.*, lx, 7, pp. 433–452, 4 figs., 1940.

A comprehensive, tabulated account is given of the writer's studies on three hitherto undescribed mosaic diseases of the pea, herein designated pea mosaic virus 4, pea mosaic virus 5 (pea stunt mosaic), and alsike clover mosaic virus 2, as well as on alsike clover mosaic virus 1, previously reported by Wade and Zaumeyer [*R.A.M.*, xviii, p. 6]. (In F. Weiss's classification of the legume viruses [ibid., xix, p. 230], pea mosaic virus 4 becomes *Pisum* virus 3 A, pea mosaic virus 5 *Pisum* virus 5, alsike clover mosaic virus 1 *Trifolium* virus 3, and alsike clover mosaic virus 2 *Trifolium* virus 3 A.) The viruses were differentiated on the basis of (1) the symptoms they produce on peas and beans, (2) the susceptibility and resistance of several varieties of pea, bean [*Phaseolus vulgaris*], other legumes, and other hosts, and (3) physical characters.

Pea mosaic virus 4, isolated from diseased plants in north-eastern Colorado, induced relatively mild symptoms on the test varieties, Dwarf Telephone, Telephone, and Green Giant, in greenhouse inoculations, the typical foliar mottling somewhat resembling that described by Stubbs for pea viruses 2 B and 2 C [ibid., xvi, p. 583]. The dark green tissue was mostly situated next to the veinlets, while small yellowish streaks or islands appeared later.

Pea mosaic virus 5 produced severe stunting of the two Telephones, the affected plants reaching only about a quarter of their natural size, but mottling was faint. The internodes were shortened, and an intense purple discoloration of the stem was followed by contraction of the tissue. The infected leaves were killed about a week after inoculation and necrosis ensued, starting at the base of the lamina and later extending over the entire leaflet. On Dwarf Telephone the growing point was often rosetted, the internodes were shortened, and the leaves were very compact, curled, and abnormally small. Both on this variety and Telephone the terminal growth frequently became flaccid and died, and later the whole plant succumbed. Green Giant reacted quite differently to pea mosaic virus 5, showing little stunting or foliar malformation but decided mottling.

All three test varieties responded similarly to inoculation with alsike clover mosaic virus 1, the typical foliar mottling due to which was reminiscent of that caused by pea virus 3 [ibid., xvii, p. 91], though slightly less intense, and also of Stubbs's 2 B.

The symptoms induced by alsike clover mosaic virus 2 were more severe than any of the others reported, stunting being particularly noticeable on Dwarf Telephone. There was no mottling, but the inoculated leaves usually died. Above the region comprising the first, and sometimes the second, node from the site of inoculation, the leaves were yellowish-green, crinkled, and only a quarter to one-eighth of the normal size. Typical symptoms, followed by the development of numerous small, brown, necrotic spots, appeared on the leaves arising from buds at the axils of the inoculated leaves, as well as on the offshoots emerging from below the site of inoculation. The infected leaflets and stipules presented a water-soaked, semi-transparent aspect. The diseased leaves finally died and were shed, leaving the bare stem and the malformed growing tip, which sometimes died later, a few green, apparently normal leaves remaining above the point of inoculation. The stems and petioles became very brittle, and such pods as were produced were malformed, badly spotted and pitted, and failed to reach maturity.

Of the 12 pea varieties inoculated with the four viruses, all were susceptible except Horal, Little Marvel, Perfection, Surprise, and Wisconsin Early Sweet.

Of the seven bean varieties inoculated with the four viruses, Stringless Green Refugee was susceptible to all, Great Northern U.I. No. 1 to pea mosaic virus 5 only; Corbett Refugee and Wisconsin Refugee were resistant to pea mosaic virus 4 and U.S. No. 5 Refugee to pea mosaic virus 5. Considerable differences were observed in the symptoms produced on the several varieties.

Pea mosaic virus 4 was the only one of the four viruses to infect red clover, other susceptible hosts of the viruses being confined to the Leguminosae. Hosts susceptible to one virus were generally susceptible to all.

The thermal inactivation points of pea mosaic viruses 4 and 5 and alsike clover mosaic viruses 1 and 2 were found to lie between 62° and 65° C., 60° to 62°, 60° to 62°, and 54° to 58°, respectively. Pea mosaic viruses 4 and 5 and alsike clover mosaic virus 2 were still capable of causing infection at a dilution of 1 to 8,000, at which point alsike clover mosaic virus 1 had lost its potency, though it was still infectious at 1 to 6,000. After ageing *in vitro* for one to two days pea mosaic virus 4 and the two alsike clover mosaics were no longer infectious, while pea mosiac virus 5 was deprived of its virulence in less than one day.

A table is given showing certain important differential characters of most of the viruses affecting pea.

Crosier (W. F.). **Sub-committee on seed sanitation.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1939*, p. 77, 1940.

This report gives the results of chemical treatment of pea seed of the varieties Chief, Thomas Laxton, and Winner against *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xiii, p. 495] and *Sclerotinia sclerotiorum* in seed germination tests. It was shown that the presence of *C. solani* in

or on 5 per cent. of peas is sufficient to interfere with the appraisal of the seed stock. Either cuprous oxide or ceresan applied only to the inocula of mummified peas increased the percentages of healthy sprouts. When either chemical was applied to both seeds and mummified peas, as would occur in commercial practice, the apparent germination closely approximated that of the uninoculated control. The presence of *S. sclerotiorum*, which is stated to be an infrequent associate of pea seed, in only one pea may destroy one-half of the seedlings in a 100-seed test. In experiments with Thomas Laxton and Winner varieties untreated seeds were seriously injured by the fungus. When applied to the seed ceresan also partially protected the sprouts from infection by *S. sclerotiorum*, and when both seeds and mummified peas were treated, very accurate germination readings were obtained, while cuprous oxide was noticeably less effective. Taken collectively, the results showed that the two fungi destroy many seeds and sprouts in germination tests of untreated seed and thus reduce the accuracy of the reading, and that treatment reduces infection and expedites the reading of the tests.

OGILVIE (L.), CROXALL (H. E.), & HICKMAN (C. J.). **Cuprous oxide as a seed protectant for Peas.**—*Rep. agric. hort. Res. Sta. Bristol, 1939*, pp. 88–99, [1940].

Greenhouse and field trials are described of the effect of seed treatment with cuprous oxide on pre-emergence damping-off of peas (*Pythium* spp., including *P. ultimum*, *Fusarium*, and other genera) [*R.A.M.*, xix, p. 2].

In the first greenhouse test the percentages of emergence of seeds treated at the rate of 0·25 per cent. by weight in two samples of market-garden soils were 78 and 85 compared with 13 and 33 for untreated seed. In another test with eight varieties considerable increases in emergence were obtained, except when the untreated seed gave very high emergence, the averages of the percentages listed in the four sets of experiments being 84, 81, 82, and 83 for the treated seed and 67, 69, 39, and 48 for the untreated. Variation in the results is attributed to differences in the environmental conditions [ibid., x, p. 577], and experimentally it was confirmed that the shorter the interval between sowing and watering the greater was the loss due to pre-emergence damping off. In comparative tests with four proprietary organo-mercury seed dressings [unspecified] and cuprous oxide the latter compared favourably with the former.

In a field experiment, early sowings made on 25th February and 11th March, 1937, showed very marked pre-emergence damping-off, and treatment with cuprous oxide increased the percentage of seedlings emerging from 8 to 32 and from 26 to 65, respectively, in Surprise peas and from 23 to 61 and 31 to 67, respectively, in the Early Bird variety. In the later sowings under conditions favourable to germination the increase in stand from seed treatment was negligible. Other field trials confirmed these results. A comparative field trial of cuprous oxide with an organo-mercury product [unspecified] as a dressing showed the protection to be similar. Evidence is presented that cuprous oxide may retard the rate of seedling emergence and in dry soils may cause injury to certain varieties, e.g., Eclipse.

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ZOSSIMOVITCH (V. P.). **New hybrids of wild and ordinary Beets resistant to Cercospora.**—*Plant Breed. & Seed Grow.*, ix, 1, pp. 12–16, 1939. [Russian. Abs. in *Facts ab. Sug.*, xxxv, 7, p. 36, 1940.]

The results of hybridization experiments between the common beet and *Beta maritima* of western European origin denoted the possibility of developing strains resistant to *Cercospora* [*beticola*]. The cultural types arising as early as the F_2 generation approximated closely to the normal in respect of root form and sugar content, and under conditions favouring heavy infection produced higher yields than the E strains [*R.A.M.*, xvii, p. 284]. Back-crossing of the hybrids with sugar beets has been successfully carried out, and the outlook for the development by this means of productive, resistant varieties is very promising.

UPPAL (B. N.). **Appendix K. Summary of the work done under the Plant Pathologist to the Government of Bombay, Poona, for the year 1938–39.**—*Rep. Dep. Agric. Bombay, 1938–9*, pp. 203–211, 1940.

The following are among the items of interest in this report [cf. *R.A.M.*, xviii, p. 437]. The *Fusarium* causing wilt of *Lathyrus sativus* was found to make good growth between 17° and 31° C., with an optimum between 25° and 27°, earliness of attack and severity of infection being characteristic features of the disease at 25°. Two of the five *L. sativus* strains from the Institute of Plant Industry at Indore tested for resistance to wilt gave very promising results, viz., 'type 1, plant 37' and 'type 148, plant 2'. Selections for wilt resistance have been made from the crops in the Poona and Broach districts and will be further tested in the infected plot.

The causal organism of soft rot of ginger has been identified as *Pythium myriotylum* [ibid., xviii, p. 472], the oogonia of which measure 22 to 41 μ and the oospores 16·5 to 30 μ in diameter.

Mottle leaf of oranges, which occurs in a severe form in Gujarat and the Deccan, proved amenable to treatment with a zinc sulphate-lime mixture (5–2½–50) plus casein or agral I or II.

The Kali and Basri banana varieties, the latter a good commercial type, showed a high degree of resistance to Panama disease [*F. oxysporum cubense*] in trials in heavily infested soil near Narayangaon, where the local Sone variety was entirely susceptible.

Types of cotton showing 100 per cent. resistance to wilt [*F. vasinfectum*] (p. 33) have been isolated from the cross (B.D. 8×S. 7–1) and the Broach back-cross (B.D. 8×G.A. 26)×B.D. 8, and B.D. 8 [ibid., xix, p. 15]. Similar results have been obtained with some of the *Gossypium arboreum* var. *neglectum* cottons now being used as parents in crosses with Jarila and N.R. 5 with a view to securing a fully resistant type possessing the staple of Jarila and other desirable economic characters for extension in the Khandash tract. Very promising results have also been given in the Jalgaon Section by the Million Dollar and New Million Dollar selections, the latter originating in China.

HOPKINS (J. C. F.). **Annual Report of the Senior Plant Pathologist for the year ending 31st December, 1939.**—*Rhod. agric. J.*, xxxvii, 7, pp. 411–423, 1940.

In this report on plant disease work in Southern Rhodesia in 1939 [cf. *R.A.M.*, xviii, p. 784] it is stated that *Nematospora coryli*, previously found in Rhodesia only in internally rotted cotton bolls, was isolated from sunn hemp [*Crotalaria juncea*] seeds. The percentage of infected seeds in the lots examined was very high, only 42 to 59 per cent. of the plants grown from commercial and specially selected seed sown in pots surviving. Seed treated with mercurial dusts and sown in beds showed no significant increase in number of plants surviving over the controls, percentage survival ranging from 49 to 59 per cent. The evidence indicated that infection followed puncturing of the partially developed pods by *Aspilocryphus fasciativentris*.

Maize lodging was caused by *Gibberella saubinetii*, which produced rotting of the pith, crown roots, and anchor roots. Germination tests revealed a deplorable amount of infection of maize seed by cob-rotting fungi (*G. saubinetii*) [and *Diplodia zeae*: ibid., xix, p. 83], attributable to slackness in seed selection coupled with heavy rains in the previous season. Growers must reject for seed purposes cobs showing even the smallest amount of discoloured grain and should adopt seed disinfection with mercurial dusts as a routine practice.

Imported Up-to-Date potatoes showed the presence of a rather large amount of powdery scab (*Spongospora subterranea*), while most consignments also contained a small percentage of tubers infected by *Actinomyces scabies*. When diseased and healthy 'seed' was planted in pots in the laboratory neither disease appeared in the subsequent crop. It is improbable that powdery scab survives in Rhodesian soils, while *A. scabies* is of no importance in good, fertile soils.

About 20 per cent. of a consignment of Hindenburg potatoes imported from Poland appeared to be affected by spindle tuber [ibid., xviii, p. 155].

A disease of papaw trees apparently identical with mosaic as found in Trinidad [ibid., xviii, p. 808] was recorded for the first time.

Tobacco wildfire [*Bacterium tabacum*: ibid., xviii, p. 483] was exceptionally prevalent, appearing in all tobacco areas and in many instances on new farms. Field spraying has been adopted by numerous growers. The reason for the outbreak has not yet been ascertained. The abnormally heavy rains experienced early in the season would have induced

severe attacks, but natural spread fails to explain the sudden appearance of a few infected plants in one corner of a piece of land, or the presence of a disease patch three yards long in one seed-bed among hundreds on one farm, or general infection in all plantings on a new farm where tobacco has not previously been grown, 20 miles away from the nearest tobacco.

Brown spot (*Alternaria longipes*) [loc. cit.] caused very heavy losses almost everywhere. By destroying most of the full-bodied leaf, the outbreak was largely responsible for the short weight and light texture of the crop. Many growers who had not been troubled with the disease before lost the top three or four leaves of their entire crop, while others saved their plants only by allowing suckers to grow unchecked, so reducing the body of the leaf.

Tobacco rosette [ibid., xviii, p. 347] was very widespread, but caused little damage, most growers recognizing the disease and roguing out the affected plants.

'Little leaf' [ibid., xix, p. 197] was widely prevalent on all kinds of deciduous fruit trees, including vines. Applications of zinc sulphate in some cases produced immediate response.

New records included *Sclerotium rolfsii* on apricot roots, *Verticillium* (?) *agaricinum* causing mouldiness of cultivated mushrooms (*Pholiota* sp.), *Phomopsis* (probably *Diaporthe phaseolorum*) [ibid., xv, p. 277] on tomato fruits, cassava mosaic, *Fusarium scirpi* var. *filiferum* in cotton bolls, *Plectodiscella* [*Elsinoe*] *veneta* on loganberry stems and leaves, *F. bulbigenum* var. *lycopersici* on carnation roots, *Phyllosticta solitaria* [ibid., xvii, p. 608] on the apple, *Stachylidium theobromae* and *Glomerella cingulata* on banana fruits, and *F. moniliforme* [*Gibberella fujikuroi*] and *Phytophthora citrophthora* on lemon fruits.

Fourteenth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1939–1940.—100 pp., 2 maps, 1940.

On pp. 17–54 of this report [cf. *R.A.M.*, xix, p. 70] G. H. Cunningham states that during the period under review plant diseases recorded in New Zealand for the first time included *Sclerotinia sclerotiorum* on imported kumara [sweet potato] tubers, scald (*Rhynchosporium secalis*) [*R.A.M.*, xix, p. 119] on commercial malting barley, and wilt (*Polyspora lini*) [ibid., xviii, pp. 127, 256] on linen flax. As the list of new diseases imported into New Zealand increases every year, it is evident that stricter quarantine regulations are necessary. *Phoma lingam* was found on cabbage stems in Auckland, a new record for this host in New Zealand.

Only one biotype of wheat stem rust (*Puccinia graminis*) was found during the past season, though in previous years two (Nos. 34 and 45) were isolated by overseas workers. Seven biotypes of wheat leaf rust (*P. elymi*) [*P. triticina*] appear to be present, and at least two of loose smut (*Ustilago tritici*). A study of ergot strains from different grasses showed only *Claviceps paspali* [ibid., xviii, p. 658] and *C. purpurea* [ibid., xix, pp. 272, 391] to be present, the former on *Paspalum* only, the latter on a wide range of grasses including rye grass [*Lolium perenne*], cock's foot [*Dactylis glomerata*], Yorkshire fog [*Holcus lanatus*], and tall fescue [*Festuca elatior*]. Proof was obtained that ergot does not

perennate in the host, and cannot be toxic to stock except when grasses are allowed to seed.

In trial plots, all varieties of French beans [*Phaseolus vulgaris*] became affected by bacterial wilt (*Bacillus* [*Bacterium*] *medicaginis*) [ibid., xiv, p. 140], only two, viz., the Burnley selection of Canadian Wonder and Pale Dunn, showing some resistance.

Evidence was obtained that tomato streak is due to a combination of tobacco mosaic and an unidentified virus [ibid., xix, p. 372].

The oil variety of flax, Rio, was ascertained to be resistant to *Fusarium lini* and immune from browning (*Polyspora lini*). Ten minutes' seed immersion in water at 126° eliminated *P. lini*, and by this means small nuclei lines of clean seed were obtained.

In glasshouse tests under commercial conditions shirlan AG (containing 25 per cent. salicylanilide) gave excellent control of tomato leaf mould [*Cladosporium fulvum*: ibid., xix, p. 243].

'Eye rot' or 'dry eye rot' of Jonathan and Cox's Orange apples, caused by *Botrytis cinerea* and common in the Nelson district, has been responsible for the rejection of fruit from export, as it was considered that fungal growth might continue. Attempts to isolate the fungus from infected apples were unsuccessful, and it is concluded the fungus was no longer viable in the lesions.

At Hawke's Bay, apple black spot [scab: *Venturia inaequalis*] was controlled by a spraying programme with lime-sulphur (1 in 300) plus colloidal sulphur (50 per cent. sulphur content) at 1 lb. per 100 gals., adjacent control trees having up to 20 per cent. infection. At Huapi, lime-sulphur (1 in 200) plus colloidal sulphur (25 per cent. sulphur content) at 2 lb. per 100 gals. gave control of both scab and powdery mildew [*Podosphaera leucotricha*], though the controls became heavily infected. In one programme in which Bordeaux mixture replaced sulphur from December onwards, apparent control of *P. leucotricha* was obtained, the fungus being absent from the treated trees, but present on the controls.

Pear black spot (*V. pirina*) was controlled by Bordeaux mixture ($1\frac{1}{2}$–2–50) instead of 3–4–50, applied after blossoming, the treatment causing much less russeting than the stronger concentration. As in earlier seasons, infection was much more difficult to control on trees heavily infected before, indicating that the source of carry-over was infected twigs.

A survey of commercial strawberry areas showed that yellow edge [see below, p. 661] was present in every planting. The most serious raspberry cane disease in New Zealand is that caused by *Leptosphaeria coniothyrium* [ibid., xvi, p. 47], which can be effectually combated by three applications of Bordeaux mixture.

Citrus mottle leaf again showed immediate response to spray applications of manganese [ibid., xix, p. 70], though soil treatments [with the same material] had no effect. Determinations made on samples of healthy, slightly mottled, and badly mottled citrus leaves showed the presence of 20·2 and 24, 10·2 and 15·4, and 4·7 and 6·2 p.p.m. manganese in dry matter, respectively. Magnesium was also low in badly mottled leaves.

In further investigations on the refrigerated gas storage of fruit,

Jonathan apples stored at 42° F. in 9 per cent. carbon dioxide with 12 per cent. oxygen remained completely free from Jonathan spot [ibid., xviii, p. 657], though the controls, stored in air, became markedly affected. Superficial scald [ibid., xix, p. 290] was severe on Sturmer apples cool-stored in air, but failed to develop on fruit stored in atmospheres of over 3 per cent. carbon dioxide, in which, further, fungal wastage was greatly retarded, such wastage being almost completely eliminated in atmospheres containing 9 per cent. of the gas.

Studies on the effect of manurial treatments on the storage quality of apples showed that 4 lb. ammonium sulphate per tree, given in addition to a normal dressing of phosphate and potash, markedly increased susceptibility to breakdown in Dunn's Favourite. With Jonathan apples, nitrogenous dressings in the 'off' year increased the amount of breakdown and fungal infection, such increase being roughly proportional to the amount of nitrogen used; nitrogen and potash both increased susceptibility to Jonathan spot, though injury was very slight. Most samples of Sturmer apples showed a high percentage of wilting, but fruits from trees given nitrogen alone were frequently subject to breakdown and resistant to wilt. Phosphate treatment increased wilt but reduced breakdown. When two applications of both 0·1 and 0·25 per cent. borax sprays were made on Cox's Orange Pippin, Jonathan, and Sturmer apples, the boron content of the fruit was markedly increased, but storage quality remained unaffected. Trees treated with 3 lb. borax per tree three years ago are stated still to bear fruit showing liability to breakdown. When the boron content of the fruit rises above 30 p.p.m. the storage quality of the fruit suffers [ibid., xix, p. 604].

One shipment of oranges from Raratonga, Cook Islands, contained 40 per cent. wastage, caused by *Phytophthora citrophthora*, while another, from Aitu, showed up to 30 per cent. wastage due to *Oospora citri-aurantii*, introduced into the packing cases on windfalls.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 7, pp. 383–386, 4 figs., 1940.

All commercial varieties of strawberries grown in New South Wales have now become affected by crinkle [*R.A.M.*, xviii, pp. 537, 604], with the result that most growers find this crop unprofitable. The disease was probably introduced on some new variety, though the actual date of introduction is unknown. Planting material should be selected only in late autumn and winter, when symptoms are most pronounced. Runners should be taken only from healthy plants and those selected set at least 100 yds. from affected beds. In spring and late autumn the new beds should be carefully rogued of all affected plants and all their runners. If the planting is extensive, a special nursery bed should be maintained, to which detailed attention can be given. Runners purchased from nurserymen should be carefully examined. The most promising variety to plant is Cresswell Seedling, which has shown some degree of resistance.

Potato hollow heart [ibid., xix, p. 299] is common in certain large-tubered, rapidly growing varieties during wet seasons or in very fertile soils, and appears to be induced by an over-rapid or irregular growth

rate. Control consists in regulating the rate of growth of developing tubers by selecting varieties whose growth progresses at a normal rate and by exercising care in the use of fertilizers and water; closer spacing is of value.

Owing to the very dry conditions prevailing last summer, supplies of French bean [*Phaseolus vulgaris*] seed were very short, with the result that growers in areas where bacterial blight [*Bacterium medicaginis* var. *phaseolicola*: ibid., xv, p. 766; xvii, p. 577] is important, such as the Gosford, Wyong, and Far North Coast areas, may not be able to obtain clean seed. In these circumstances, spread must be restricted as much as possible by roguing.

HANSFORD (C. G.). **Report of the Senior Plant Pathologist.**—*Rep. Dep. Agric. Uganda, 1938–39* (Part II), pp. 28–29, 1940.

In this report [cf. *R.A.M.*, xviii, p. 575] the author states that during the period under review pot inoculations were made on B.P. 50 cotton, *Crotalaria juncea*, and *C. striata* [*C. saltiana*] with strains of *Verticillium dahliae* from a wide range of hosts, the inoculations being made into the soil of the pots, sterilized before planting. Almost all the strains gave infection on B.P. 52 cotton, which is known to be susceptible under field conditions at Bukalasa. Few infections resulted on *C. juncea* and *C. saltiana*, and a large proportion of the Uganda stocks of these plants are probably resistant. No constant morphological or biological differences between the strains of *V. dahliae* used were noted, the evidence indicating that the fungus has a wide host range. With B.P. 50 cotton, the incubation period ranges from about six weeks to late in the development of the plant.

Further cross-inoculation studies with strains of *Fusarium* of the *Elegans* section [ibid., xix, p. 342] demonstrated that the *Fusarium* isolated from naturally infected *C. juncea* is able to attack some plants of *C. saltiana*, though other individual plants are resistant, while the fungus isolated from natural infections of *C. saltiana* is able to attack *C. juncea*. Positive results on *C. juncea* were obtained by inoculations with *F.* strains from natural infections on cotton, *Sesamum indicum*, and chilli (*Capsicum frutescens*). A few infections were obtained on B.P. 50 with strains from widely different hosts, a fair proportion of plants of this variety being resistant to *Fusarium* attack.

In 1937, simsim [*S. orientale*] at Kampala suffered rather severe infection by *Rhizoctonia bataticola* [*Macrophomina phaseoli*]. The fungus was isolated in culture, but inoculation tests gave negative results. It is concluded that *M. phaseoli* is at most a very weak parasite of *S. orientale*.

Report of the Agricultural Department, Dominica, 1939.—17 pp., 1940.

The following items of interest occur on p. 9 of this report [cf. *R.A.M.*, xix, p. 134]. The average incidence of Panama disease [*Fusarium oxysporum cubense*] of bananas for all districts of Dominica in 1939 was 1·02 per cent. in 28,008 stools inspected at monthly intervals during 1940. So far, only one small plantation is known to be affected by *Cercospora* [*musae*], and drastic control measures have reduced infection to negligible proportions. No causal organism has

been found associated with black pod rot of vanilla and as the trouble has so far occurred only in dry years, it is thought that it may be of physiological origin.

CRAIGIE (J. H.). **The origin of physiologic races of rust fungi through hybridization.**—*Publ. Amer. Ass. Adv. Sci.* 12, pp. 66–72, [1940].

This is a review of recent developments in the knowledge of the origin of physiologic races of rusts through hybridization, with special reference to *Puccinia graminis* on cereals. Nearly all the papers included in the survey have been noticed from time to time in this *Review*.

PETERSON (R. F.) & LOVE (R. M.). **A study of the transference of immunity to stem rust from Triticum durum var. Iumillo to T. vulgare by hybridization.**—*Sci. Agric.*, xx, 11, pp. 608–623, 1940.

A series of experiments has been carried out at the Rust Research Laboratory, Winnipeg, in an attempt to transfer to *Triticum vulgare* the immunity from *Puccinia graminis tritici* possessed by *T. durum* var. Iumillo. The progeny from six crosses made by K. W. Neatby in 1930 to 1932, using Iumillo as one parent and Marquis, Hope, R.C. 729, Garnet, Marquillo, and Ceres as the others [*R.A.M.*, xi, p. 227; xii, p. 750], was multiplied and the resistant plants from the F_2 to the F_6 generations were selected for further study, the selected material comprising 48 *vulgare*-like lines of wheat and 2 *durum*-like lines possessing *vulgare* characteristics.

Repeated field tests under artificially induced epidemics involving many physiologic races of *P. g. tritici* showed all 50 lines to be immune or almost immune in the mature plant stage, even though most lines contained plants with abnormal chromosome numbers and behaviour.

In greenhouse tests of seedling reaction no line was immune from all nine races used, but 17 *vulgare* lines from five F_2 plants were immune from, or resistant to, all. The remaining 33 lines were susceptible to one or more races, but most were immune from, or resistant to, a number. On the whole, the lines were more resistant in advanced than in early stages of growth.

In the *vulgare*-like lines the chromosome numbers found were 38, 39, 40, 41, 42, and 43, while in the *durum*-like lines all the plants had 28. Approximately 40 per cent. of the plants examined cytologically had 42 chromosomes, and approximately 50 per cent. were heterozygous for the arrangement of one or more segments of chromosomes. Eighty-one relatively stable 42-chromosome plants were found, some of which have been used to establish re-selections for further work. Morphological studies demonstrated that many plants closely approached the *vulgare* type. The genes for the *vulgare* morphological condition were not found to be confined to the so-called C set of chromosomes.

The evidence indicated that the mature-plant immunity of one of the *vulgare*-like lines when crossed with other *vulgare* wheats is more simply inherited than that of Iumillo crossed with *vulgare*. In both cases inheritance appears to be more complex than that of the mature plant resistance of Hope or H-44 (*vulgare* derivatives of Marquis × Yaroslav Emmer) in intra-*vulgare* crosses.

It is concluded that the object of developing varieties of *T. vulgare*

with the immunity from stem rust of Iumillo has been closely approximated though not fully achieved.

MEHTA (K. C.). **Wheat and other cereals research. (i) Investigation of cereal rusts.**—*Rep. imp. Coun. agric. Res., Calcutta, 1938–9*, p. 7, 1939. [Received September, 1940.]

During the period under review further evidence was obtained of the over-summering of rusts in the uredo stage in the hills in India [*R.A.M.*, xviii, p. 511]. Black rust [*Puccinia graminis*] was found to survive the summer even at altitudes of 3,500 to 4,000 ft. in one locality in the North-West Frontier Province. In the plains yellow rust [*P. glumarum*] was observed generally during February, and brown [*P. triticina*] and black in March to April, while even earlier records came to hand of the appearance of the first-named in January and of *P. triticina* in February in the Punjab. No over-summering of rusts was reported from the hills of the Bombay–Deccan, but *P. graminis* developed in several districts in January and February. In the Nilgiris and Palni hills, rusts were as usual detected on the first (April- to June-sown) crop from July onwards, and by the end of August all three were present in profusion (60 to 100 per cent. in some fields) in the Nilgiris. In one region of Mysore *P. graminis* was observed early in December, and in another it appeared in the miniature plot on 21st January.

MEHTA (K. C.) & PAL (B. P.). **Rust-resistant Wheats for India.**—*Nature, Lond.*, cxlvi, 3690, p. 98, 1940.

Up to the present six races of black rust of wheat [*Puccinia graminis*] (including the virulent and widespread race 15), six of brown rust [*P. triticina*], and nine of yellow rust [*P. glumarum*] have been found in India [see preceding abstract]. The greatest obstacle to breeding for rust-resistant wheats has been the total lack of *vulgare* varieties resistant to the Indian races of *P. graminis*, but in experiments at the Agra College and at the Imperial Agricultural Research Institute, New Delhi, a batch of *vulgare* wheats received from the Director of Agriculture, Kenya, has shown promising resistance, and one of them, E. 144, proved highly resistant to races 15 and 40 and markedly resistant in the mature stage to all races of black rust; E. 148 was highly resistant in the seedling stage to all races of yellow rust. These varieties, though too late maturing and unproductive for direct cultivation in India, should prove invaluable for breeding.

BRIGGS (F. N.). **Linkage between the Martin and Turkey factors for resistance to bunt, Tilletia tritici, in Wheat.**—*J. Amer. Soc. Agron.*, xxxii, 7, pp. 539–541, 1940.

A recent re-examination, at the University of California, of the data from all the six wheat crosses involving the Martin and Turkey factors for resistance to bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, xv, p. 351] revealed only 25 susceptible rows where 53·4 were expected out of a total of 854. Calculating the linkage between the Martin and Turkey factors for the entire population, a cross-over of 34·22 per cent. was obtained. On this basis the anticipated numbers for all crosses approximated much more closely to those actually secured than when the two factors

were considered independently. Out of 190 rows of Martin×Turkey 3055, 183 were resistant or segregating (these two classes could not be accurately separated), the corresponding figures for 183 Martin× Turkey 1558, 140 Sherman×Turkey 3055, 104 Martin×Oro, 118 Martin×Turkey 1558B, and 119 Martin×Turkey 2578 being 179, 136, 101, 114, and 116, respectively. With the exception of Martin× Turkey 1558, these numbers agree with those expected on the basis of the 15 : 1 ratio.

DÉFAGO (G.). **Influence de l'aneurine et de l'hétéro-auxine sur la croissance de trois parasites de Blé.** [The influence of aneurin and heteroauxin on the growth of three Wheat parasites.]—*Ber. schweiz. bot. Ges.*, xlix, pp. 413–414, 1939.

Preliminary results are described in an investigation undertaken to ascertain whether certain anomalies in the biology and parasitism of *Tilletia tritici* [*T. caries*] on wheat are explicable on the basis of the production of auxogenic substances by the host, *Cercosporella herpotrichoides* and *Ophiobolus herpotrichus*, which attack wheat at the base and roots, being used for comparison. Aneurin was found to be an indispensable factor in the growth of *T. caries* and *C. herpotrichoides*, the optimal concentrations being 0·2 γ and 0·4 γ per 25 c.c., respectively. *C. herpotrichoides* is capable of synthesizing thiazol but not pyrimidin, while neither of these components of aneurin contributes appreciably to the development of *T. caries*. *O. herpotrichus* (like *O. graminis*) failed to respond positively to vitamin B^1, high concentrations of which even tended to retard its growth. The development of both *T. caries* and *C. herpotrichoides* was delayed by indol-3-acetic acid at 1 and 150 γ per 25 c.c., respectively, *O. herpotrichus* being less sensitive to this factor.

TYNER (L. E.). **The effect of crop debris on the pathogenicity of cereal root-rotting fungi.**—*Canad. J. Res.*, Sect. C, xviii, 7, pp. 289–306, 2 figs., 1940.

In greenhouse experiments conducted from 1935 to 1939, the differential effect of wheat, barley, and oat straw on the development of the root rots of wheat caused by *Ophiobolus graminis*, *Fusarium culmorum*, and *Helminthosporium sativum* [cf. *R.A.M.*, xix, p. 11] was investigated. The straw was composted with soil and added to the pots in which inoculated and uninoculated (control) seedlings were grown. In general, the wheat straw composts were appreciably more conducive to the development of disease than those of either barley or oat straw, the latter being the least favourable. This is explained on the assumption that the dominant microflora of the oat straw composts is somewhat antagonistic to the pathogens, or characteristically different from that of the other two. Some evidence was obtained indicating that high concentrations of straw in a compost increased the severity of disease, but this effect was not very consistent in different plantings. The carbon to nitrogen ratio had apparently less effect than the chemical nature of the straw upon disease development. The artificial inoculum added to the pots was practically vitiated before the second crop; subsequently the *H. sativum* and *F. culmorum* infection tended to increase again, while *O. graminis* disappeared completely. Apparently the

conditions necessary for the rapid increase of *O. graminis* infection observed in the field were not provided in the greenhouse. Plants grown on wheat straw composts were, in general, the least, and those grown on the barley straw composts the most vigorous, while growth on oat straw composts varied. The vigour of plants grown on wheat straw composts was least at the highest concentration, while for barley straw the opposite was true. The differences in nitrate nitrogen content [cf. ibid., xix, p. 269] of the three kinds of straw were not directly proportional to the variations observed in plant vigour. The introduction of a short fallow period between plantings decreased the amount of infection somewhat and increased the vigour of the plants. The author concludes that the observed differences in persistence and virulence of the pathogen and in plant vigour were due chiefly to differences in the microflora associated with the various composts.

SALLANS (B. J.). **The relationship of weeds to losses caused by common rootrot in Wheat.**—*Sci. Agric.*, xx, 11, pp. 632–637, 1 graph, 1940.

In an experiment carried out in Saskatchewan in 1937 to test the effect of the inoculation of Reward wheat with *Helminthosporium sativum* on the development of other plants growing in competition with the crop, plots were sown with untreated wheat, inoculated wheat, wheat and flax, inoculated wheat with flax, and flax alone. At harvest, the plants were pulled, air-dried, and weighed, and the results showed that inoculation with *H. sativum* significantly reduced the yield of wheat and increased the yield of weeds. Competition from flax reduced the wheat and weed yields in both the uninoculated and inoculated plots, the yield of weeds being reduced significantly.

In a similar experiment in which the weeds used were *Chenopodium album* and *Amaranthus retroflexus*, there were significant reductions in dry plant weights of wheat resulting from inoculation, weeds, and the effect of interaction between the two. The yield of threshed grain, however, showed a non-significant increase due to inoculation, this result being associated with climatic factors. In 1939, both inoculation and weeds significantly reduced the wheat yields, but, in association with climatic factors, there was no significant interaction effect between the two treatments on yield.

It is concluded that *H. sativum* may retard wheat in the seedling stage, with the result that weeds become well established and, by impeding the tendency of the crop to throw off the infection, cause reduced yields of grain.

MIYAKE (M.). **Mendelian inheritance of the resistance against the virus disease in Wheat strains.**—*Jap. J. Genet.*, xiv, pp. 239–242, 1939. [Japanese. Abs. in *Jap. J. Bot.*, x, 4, p. (55), 1940.]

Nearly all the F_1 progeny of crosses between wheat strains susceptible and resistant to yellow and green mosaic [*R.A.M.*, xviii, p. 98] grown in seven types of soil known to be conducive to the development of the disease remained healthy, thereby affording proof of the dominance of resistance over susceptibility in regard to these viruses. In the F_2 the segregation into resistant and susceptible strains took place in the simple monogenic way.

Teakle (L. J. H.) & Wild (A. S.). **Some soil types associated with manganese deficiency of cereals in Western Australia.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xvii, 2, pp. 223–233, 2 figs., 1940.

In this paper the authors describe the chief soil types found on a 1,000-acre farm in the wheat belt, east of Wagin, Western Australia. Some 25 per cent. of the area belonging to this farm consists of soil types in which wheat and oats show symptoms of acute manganese deficiency [*R.A.M.*, xv, p. 8; xviii, pp. 547, 733; xix, p. 522]. The principal soil type exhibiting manganese deficiency is the Tinkurrin gravelly sand. This has an ashy, powdery surface and an accumulation of ferruginous and quartz gravel in the subsurface layer. The subsoil is a yellowish-brown sandy clay loam showing further clay accumulation with depth. On this soil the application of manganese sulphate at the rate of 14 lb. per acre (applied mixed with superphosphate) resulted in normal crops of wheat, whereas on untreated soil manganese deficiency symptoms developed after a few weeks and grain formation was scanty.

Teakle (L. J. H.), Turton (A. G.), & Throssell (G. L.). **Experiments on copper deficient land at Dandaragan, Western Australia.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xvii, 2, pp. 161–173, 5 figs., 1940.

An experiment is described in which Burt's Early oats were grown in soil in the vicinity of Dandaragan, Western Australia, where cereal crops had repeatedly failed, the following treatments being applied, viz., (1) control, 1 cwt. superphosphate per acre, (2), (3), and (4) 1 cwt. superphosphate mixed with 5, 15, and 30 lb. copper sulphate, respectively, and (5) 1 cwt. superphosphate mixed with 15 lb. copper sulphate, 15 lb. manganese sulphate, 20 lb. magnesium sulphate, 20 lb. ferrous sulphate, 5 lb. zinc sulphate, and 5 lb. borax per acre. The crop was sown in May, and early in September most of the plants in the control plots were dead, while the remainder showed typical symptoms of copper deficiency. At harvest time all the copper-treated plots carried an excellent growth of oats [cf. *R.A.M.*, xviii, p. 547]. No yield was obtained from the control plots, while the hay yield per acre for each of the (2), (3), and (4) treatments was 3 tons 14 cwt., and for (5) 3 tons 16 cwt., the grain yields per acre being 45·5, 45·6, 50·7, and 49·2 bushels, respectively.

It is concluded that the crop failures on this land were due to copper deficiency, and that excellent crops may be produced on the soils in question if copper is applied as a fertilizer. Five pounds of copper sulphate mixed with superphosphate suffices, or even lighter applications may prove adequate. Soil analysis is an unsatisfactory guide to copper deficiency; the most certain method of detection consists in observation of the symptoms exhibited by an indicator crop. Farmers are recommended to experiment before undertaking extensive fertilizer dressings, as these are costly, and on some soils may depress yields.

In an appendix to this paper (pp. 173–177, 6 figs.) Miss J. M. Ford describes a preliminary anatomical examination of the oats grown on the control and treated plots. The most striking difference was in the relative degree of lignification of the copper-deficient and copper-treated plants. The stem of the former had a thin-walled epidermis, with thin-walled, unlignified cells in the cortex, and thin-walled cells

in the bundle sheath and pith, while the roots also showed lack of lignification of the walls. The leaves of the copper-deficient plants showed very little differentiation of the motor cells, small and compact mesophyll cells forming a rather palisade-like mesophyll, and usually few fibres; the cuticle was poorly developed. In yellowed or withered parts, the chloroplasts had disintegrated and the cell contents had changed to brown, tannin-like globules. The leaf hairs in copper-deficient plants were fewer and smaller than in the copper-treated plants and irregularly spaced; the root hairs were also more poorly developed in the former than in the latter.

LING (L.). **Factors affecting spore germination and growth of Urocystis occulta in culture.**—*Phytopathology*, xxx, 7, pp. 579–591, 1 fig., 1 diag., 1940.

Chlamydospores of *Urocystis occulta* from rye at University Farm, St. Paul, Minnesota, germinated at a temperature range of 10° to 25° C., with an optimum at 15°, but not at 5° or 30° [*R.A.M.*, xvi, p. 666]. Solid media were found to be unfavourable to germination, neither did the spores germinate well in distilled or tap water or sugar solutions, but good growth was obtained in soil infusion. A stimulatory effect was exerted by benzaldehyde (3 : 2,000,000). Darkness or diffuse light were more conducive to germination than direct sunlight. The optimum hydrogen-ion concentration for spore germination was found to be about P_H 6·86; none took place at 3·80, but 5 per cent. of the spores germinated at 8·95.

U. occulta makes slow growth on artificial media, the colonies of monospore cultures attaining their maximum diameter of 45 mm. only after ten weeks. Sectors were commonly, but not abundantly, produced. The two haploid lines isolated from several hundred sporidial branches differed from the monospore lines in cultural characters and failed to infect rye, either singly or in combination. Monospore cultures grew on potato dextrose and malt extract agars at 5° to 25°, and on the former medium (the best of the solid substrata tested) with initial hydrogen-ion concentrations of P_H 5 to 9, the optimum being 6·2. Fair growth was supported by a number of carbohydrates, rhamnose and levulose excepted, the latter being actually toxic to the fungus. Phosphorus, nitrogen, and magnesium were indispensable mineral elements.

CHILTON (ST. J. P.). **Delayed reduction of the diploid nucleus in promycelia of Ustilago zeae.**—*Phytopathology*, xxx, 7, pp. 622–623, 1 fig., 1940.

At the United States Regional Pasture Research Laboratory, State College, Pennsylvania, young maize plants were repeatedly inoculated with cultures of *Ustilago zeae* arising from sporidia isolated from 158 chlamydospores produced by abnormal crosses between certain haploid lines of the smut, in which a high percentage of the promycelia disintegrated without forming sporidia. Both haploid and diploid sporidia were produced on the promycelia of three chlamydospores, in number one of which the first meiotic division was postponed to at least the second division of the diploid nucleus, and in numbers two and three to at least the third division [*R.A.M.*, xix, p. 527].

THOMAS (R. C.). **Additional facts regarding bacteriophage lytic to Aplanobacter stewarti.**—*Phytopathology*, xxx, 7, pp. 602–611, 1940.

In the course of studies on the bacteriophage lytic to *Aplanobacter stewarti* on maize in Ohio [*R.A.M.*, xiv, p. 503], the writer isolated from a number of cereals, grasses, vegetables, fruits, and ornamentals a non-specific 'phage precursor', inactivable by 30 minutes' heating at 56° C. On coming into contact with susceptible bacteria, this substance provokes a reaction resulting in the formation of a transmissible lytic principle which resists heating at 60° and is only partially inactivated at 65°. It is believed to be the origin of the bacteriophage in plants and to constitute a mechanism of resistance to disease. Wilt-susceptible maize varieties, such as Golden Bantam (seedlings), Golden Sunshine, Golden Evergreen, and Early White Market, were almost or wholly devoid of the 'phage precursor', which was strong, on the other hand, in the resistant Whipple's White, Stowell's Evergreen, Spanish Gold, Golden Colonial, and Country Gentleman. Several methods have been devised for freeing cultures of *A. stewarti* from its specific bacteriophage, Ivanoff's highly oxidizing medium [ibid., xiii, p. 299] being particularly valuable in this respect.

DE MELLO (I. F.). **Experimental studies on diets deficient in vitamin B and their influence on the intestinal yeast flora of animals.**—*Proc. Indian Acad. Sci.*, Sect. B, xi, 6, pp. 225–235, 1940.

A tabulated account is given of the writers' studies at Nova Goa, Portuguese India, on the relation between the yeast contents of animal (white rats, hens, rabbits, and pigeons) intestines and vitamin-deficient diets, an inquiry initiated with a view to determining the validity of the widely held blastomycotic theory of human sprue, attributed by Ashford to *Monilia* [*Candida*] *psilosis* [*R.A.M.*, ix, p. 454]. The animals were subjected to a beri-berigen régime of white polished rice, for which a normal diet was substituted on the appearance of B avitaminosis symptoms. A more or less abundant yeast flora [*Candida* and *Geotrichoides*: see next abstract] was found to occupy the intestinal tract of the experimental animals even in ordinary health, but the administration of a vitamin-deficient diet generally led to an increase in its numbers, which became intensified with progressive debility and gradually decreased to a normal level with the returning vigour conferred by suitable foods. These observations may possibly account for the development of levurotic complications in the case of patients suffering from weakness due to disease, exhaustion, or other factors.

DE MELLO (I. F.). **A report on the characters and identification of the yeasts living in commensalism in the intestine of some laboratory animals.**—*Proc. Indian Acad. Sci.*, Sect. B, xii, 1, pp. 17–28, 1940.

Of the seven types of yeast living in a state of normal commensalism in the intestine of certain domestic animals used in previous experiments on the effects of beri-berigenic diet [see preceding abstract], six were found to belong to *Candida* and the seventh to *Geotrichoides*.

DE MELLO (I. F.) & VIEGAS (J. DE S.). **The phenomena of dissociation into S and R forms observed among the bacteria do also occur in yeast cultures.**—*Proc. Indian Acad. Sci.*, Sect. B, xii, 1, pp. 1–7, 4 figs., 1940.

The writers' studies [at Nova Goa, Portuguese India] on a strain (N3) of *Candida* isolated from the intestine of a white mouse and cultured on Sabouraud's agar revealed dissociation into smooth, rough, and intermediate types [*R.A.M.*, xix, p. 595 and preceding abstract]. The pronounced disparity between the smooth and rough forms of the *C.* strain under discussion is considered to be of great interest in connexion with the taxonomic classification of these medical fungi, a revision of which in the light of recent contributions to the subject is thought to be urgently required.

MELENEY (H. E.). **Histoplasmosis (reticulo-endothelial cytomycosis): a review: with mention of thirteen unpublished cases.**—*Amer. J. trop. Med.*, xx, 4, pp. 603–616, 1940.

This review of 32 cases (13 as yet unpublished) of histoplasmosis (*Histoplasma capsulatum*) of man and animals [*R.A.M.*, xix, p. 595] is accompanied by a table showing the distribution of the disease by geographical location, age, sex, race, and organs affected. Three of the cases included in the survey were reported from the Panama Canal Zone, two from the Philippines, one each from Honduras, Java, Argentina, and Brazil, and the rest from different States of the American Union.

DART (M. O.). **Otomycosis: treatment with silver picrate.**—*Arch. Otolaryng., Chicago*, xxxi, 6, pp. 885–910, 1 fig., 1940.

This is a comprehensive survey of the literature relating to otomycosis [*R.A.M.*, xix, p. 151] and its therapy, followed by a report of 25 cases investigated by the author in which the organisms concerned were species of *Monilia* [*Candida*], *Aspergillus, A. niger, Penicillium, Alternaria, Rhizopus,* and (?) *Trichophyton.*

MACCORMAC (H.). **Ringworm of the foot.**—*Brit. med. J.*, *1940*, 4139, pp. 739–740, 1940.

In the course of this survey of the clinical, diagnostic, and therapeutic aspects of ringworm of the foot in England, the author states that only two of the more than forty fungi once believed to be implicated in the etiology of the disease are now accepted as responsible agents, viz., *Epidermophyton inguinale* [*E. floccosum*] and *Trichophyton pedis* [*R.A.M.*, xvii, p. 818], the latter probably identical with *T. gypseum.* Various species of *Monilia* [*Candida*] may also be concerned in the development of vesicular eruptions and the patches of interdigital white skin indistinguishable from ringworm proper, but the pathogenicity of this group is of a low order and seems to require a special substratum, e.g., a moist, seborrhoeic skin, for profuse growth.

FLOR (H. H.). **New physiologic races of Flax rust.**—*J. agric. Res.*, lx, 9, pp. 575–591, 1940.

In addition to the 14 physiologic races of flax rust (*Melampsora lini*) [*R.A.M.*, xviii, p. 679] previously reported by the author from the United States (*J. agric. Res.*, li, pp. 819–837, 1935), ten new ones were identified in the present study, carried out between 1935 and 1938. In order to differentiate the new races, it was necessary to add three varieties, Argentine (C.I. 462), Bombay (C.I. 42), and Ottawa 770 B (C.I. 355), all of which were previously considered immune from rust, to the list of eight originally used differential varieties. Of the 201 varieties and strains of flax selected for testing because of their diverse morphologic type, commercial importance, or their reported resistance to, or immunity from, flax rust, all proved to be susceptible to one or more of the 24 races of the fungus that have been identified. Several strains of Argentine flax and Ottawa 770 B remained immune from all races collected in North America but were susceptible to one or more of the races from South America, while Bombay and J. W. S. were immune from races of South American origin and susceptible to one or more North American races. The results of pathogenicity tests seem to indicate that each of the varieties Argentine, Bombay, J. W. S., and Ottawa 770 B possesses distinct factors governing immunity from specific races of the rust. Of the 201 varieties tested, 48, 8, 4, and 20 reacted similarly to Argentine, Bombay, J. W. S., and Ottawa 770 B, respectively, to 16 physiologic races of the rust. It has been observed that the races of flax rust with a somewhat limited varietal range were predominant in the seed flax-producing areas of the Midwest over the races with a wider range.

PRASADA (R.). **Aecidial-stage of the rust of Linseed.**—*Curr. Sci.*, ix, 7, pp. 328–329, 1940.

In a study at the Agra College, India, from 1939 to 1940, successful germination of the teleutospores (nearly 60 per cent.) of the linseed rust, *Melampsora lini* [*R.A.M.*, xix, p. 583], one of the commonest diseases in some districts of the United Provinces and Bihar, was obtained in December from material kept in a refrigerator. All attempts to obtain germination from material stored in a room were unsuccessful. These results show that the teleutospores are viable at the time of their formation on the crop in the plains. When young leaves on seedlings of linseed, raised under rust-proof conditions in a greenhouse were inoculated with teleutospores, aecidia developed 13 days after inoculation, the average maximum and minimum temperatures during the period of the experiment ranging from 63·7° to 70·8° and 47° to 51° F. It is suggested that the absence of the aecidial stage in nature in the plains of India is due to the loss of viability of the teleutospores from exposure to very high temperatures after the harvest. Inoculations with the aecidiospores obtained in the above-mentioned experiment resulted in the development of uredo pustules. In inoculation experiments with uredo material collected from Cawnpore, Allahabad, and Pusa conducted simultaneously at Agra and at Simla, no infection could be obtained even in shade after the end of April at the former

locality, while at the latter the cultures kept well under natural conditions all through the summer and even survived the winter. These results are held to indicate that the uredo stage of the rust cannot stand the heat of the summer in the plains. The role of the teleutospores in the hills, however, is not yet clear and it is uncertain whether the rust starts afresh each year in those areas from over-summering uredospores or from aecidia, hitherto unnoticed.

Muskett (A. E.) & Colhoun (J.). **Prevention of seedling blight in the Flax crop.**—*Nature, Lond.*, cxlvi, 3688, p. 32, 1940.

Seedling blight of flax (*Colletotrichum lini*) [*R.A.M.*, xviii, p. 315] is likely to assume greater importance in Northern Ireland if the cultivation of this crop and the home-saving of seed become more extensively practised. The pathogen is seed-borne, and the authors state that during the past two years a rapid and accurate technique has been evolved by the Plant Disease Division for the examination of flax seed samples for parasitic infection, and a sorting test has been devised for quick discrimination between promising and unsatisfactory seed fungicides. An experimental product submitted by Imperial Chemical Industries, styled R.D. 7846 and containing tetramethylthiuram disulphide as its active constituent, was found in preliminary tests to give very promising results against *C. lini*. It is a finely divided, apparently non-poisonous powder, and was used at the rate of 3 gm. per 500 gm. seed (approximately 5 oz. per bush. of 54–6 lb.).

Bericht der Eidgenössischen Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil für die Jahre 1935–1937. [Report of the Federal Experiment Station for Fruit-Growing, Viticulture, and Horticulture, Wädenswil, for the years 1935–7.]—*Annu. agric. Suisse*, xlv, 4, pp. 389–464, 1940.

In this report are included a number of items of phytopathological interest relating to the activities of the Swiss Federal Experiment Station for Fruit-Growing, Viticulture, and Horticulture for 1935–7, reference to some of which was made in this *Review* at the time of their publication in various journals. Mention may here be made of the following. A. Osterwalder and P. Camenzind tested a 0·5 per cent. formalin solution (or 1 in 80), 20 l. per sq. m., against *Sclerotium tuliparum* on tulips with satisfactory results, only 15 out of 87 bulbs in plots so treated on 13th October, 1936, and planted with bulbs on 3rd November becoming infected by the fungus up to April, 1937, compared with 52 out of 88 controls.

Versol, a grey-green, sulphur- and copper-containing dust manufactured by the Maag Chemical Factory, Dielsdorf, gave excellent control of rose rust (*Phragmidium* [*mucronatum*]) on the susceptible Eugen Fürst, Dr. G. Krüger, and Fisher Holms varieties, which were given eight applications between 12th June and 11th August, 1936. It was also effective against black spot (*Asteroma*) [*rosae*: *Diplocarpon rosae*] on bush roses.

Foot rot of aster (*Callistephus*) [*chinensis*] caused by a species of *Fusarium* or *Phytophthora* was well controlled by eight soil applications, between 10th July and 12th August, 1935, of either HBS soil

disinfectant (Kaufmann & Cie, Gränichen, Aargau), potassium permanganate, copper sulphate, or cupromaag, all used at a concentration of 0·001 per cent., the number of diseased plants being reduced from 39 in the untreated control to 1, 3, 5, and 8, respectively, in one set of beds and 8, 9, and 12 for the first three treatments, respectively, in another set.

Millikan (C. R.). **Leaf scorch of Narcissus.**—*J. Dep. Agric. Vict.*, xxxviii, 6, pp. 307–308, 4 figs., 1940.

Leaf scorch disease of *Narcissus* caused by *Stagonospora curtisii* [*R.A.M.*, xix, p. 97], is recorded for the first time from Victoria, where it was observed on daffodils during the 1939 season. To reduce the spread of primary infection the bulbs should be immersed for one hour in water, and then for 30 minutes in mercuric chloride, 1 in 750 (approximately 1 oz. in $4\frac{3}{4}$ gals. water). Secondary infection from infected leaf tips may be checked by four or five applications of Bordeaux mixture 4–4–50 or 20–80 copper-lime dust, but the best control results from picking off infected leaf tips as they appear.

Wallace (E. R.). **Use of disinfectants in the hot water treatment of Narcissus, 1936–38.**—*Rep. Bulb Exp., Kirton*, 7, pp. 43–56, 1940.

Rotting of narcissus bulbs by *Fusarium bulbigenum* is thought to be increased by dissemination of the spores of the fungus in the hot-water bath used for the control of eelworm. The disease has not been of any great economic importance in the Spalding area for the last nine years, but the author carried out experiments to ascertain the chemical effect of the addition of formalin on the bulbs [*R.A.M.*, xviii, p. 653]. The results obtained showed that formalin treatment increased the weight of the bulbs in five out of eight treatments in Golden Spur and Sir Watkin [daffodils]. The author recommends the use of 1 in 400 formalin as a fungicide; formalin 1 in 100 can safely be used when the bulbs are stored at a high temperature (about 80° F.) before the hot-water treatment, but where treatment in water alone is disadvantageous and where formalin 1 in 400 appears to prevent the injury, strong formalin is not advised.

Johnson (H. W.), Lefebvre (C. L.), & Ayers (T. T.). **Powdery mildew of Lespedeza.**—*Phytopathology*, xxx, 7, pp. 620–621, 1 fig., 1940.

Powdery mildew (*Microsphaera diffusa*) is stated to have caused premature defoliation of *Lespedeza* every year since 1935 at the Arlington (Virginia) Experiment Farm, occurring in 1938 in epidemic form, especially on *L. striata*, *L. stipulacea* being less susceptible, while *L. sericea* and an unnamed species, related to the last-named and *L. juncea*, are apparently immune.

Gould (C. J.). **Diseases of cultivated Lupines.**—*Proc. Ia Acad. Sci.*, xlvi, pp. 119–125, 1940.

Of the diseases of cultivated lupins herein enumerated with brief descriptive notes, the following have been reported from the United States: stem necrosis (*Ascochyta pisi*), damping-off (*Rhizoctonia* [*Corticium*] *solani*), wilt (*Sclerotinia sclerotiorum* and *Thielavia* [*Thielaviopsis*] *basicola*), sore shin, *Botrytis cinerea*, *Erysiphe martii*, *Pythium de*

Baryanum, tomato spotted wilt, and two destructive wound parasites, *Collybia velutipes* and *Pleurotus ostreatus*, causing discoloration and decay of the wood within the stems of *Lupinus arboreus* (a valuable soil retainer on sand dunes in the San Francisco region), culminating in the partial or total death of the plants (*Phytopathology*, xi, pp. 389–404, 1921).

AGNEW (E. L.) & CHILDERS (N. F.). **The effect of two mild sulphur sprays on the photosynthetic activity of Apple leaves.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 379–383, 6 graphs, 1940.

Elemental sulphur fungicides are known to be less effective against apple scab (*Venturia inaequalis*) than lime-sulphur but have the advantage of causing practically no visible leaf injury. In experiments made at the Ohio Agricultural Experiment Station to study the effect of two mild sulphur sprays (the first consisting of 5 lb. sulfix, an elemental sulphur, and 3 lb. dry lime-sulphur per 100 gals. and the second of magnetic spray wettable sulphur, 8 lb. per 100 gals.) on the photosynthetic activity of apple leaves [*R.A.M.*, xviii, p. 685], it was found that little or no injurious effect was produced in this respect, except in one instance with the former material. In this experiment, reduced assimilation was associated with the highest maximum temperatures, 83° to 86° F., for the first three days after spraying. The reductions were 36, 16, and 15 per cent. on the first, second, and fourth days after spraying. After application of the magnetic spray sulphur, the daily temperature attained 88° on two days and was over 80° on six days. These results confirm the view that sprays containing sulphurs in suspension have less effect on the photosynthesis of apple leaves than sprays containing sulphurs in solution.

THIES (W. H.). **Effects of heavy applications of dusting sulfur on soil acidity and cover crop in an orchard.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 76–77, 1940.

The author states that the use of large quantities of dusting sulphur is causing a marked change in soil acidity in New England orchards. In a McIntosh apple orchard receiving about 1½ tons of sulphur per acre for 15 years the surface soil was very acid (from P_H 3·5 to 4·75) and only the most acid-tolerant plants could survive, but in spite of this the trees are vigorous and are cropping heavily. The soil should, however, be limed occasionally.

MACDANIELS (L. H.) & HILDEBRAND (E. M.). **A study of pollen germination upon the stigmas of Apple flowers treated with fungicides.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 137–140, 1940.

In studies carried out at Cornell University, Bordeaux mixture (2–6–100), copper-lime dust (20–80), and mike sulphur reduced but did not inhibit pollen growth on the stigma of apple flowers. Elgetol [*R.A.M.*, xix, p. 353] at 0·25 per cent. prevented pollen germination on the stigmas. Field trials indicated that the last-named material is highly promising for spraying when apple trees are in bloom to inhibit fruit set, an effective, non-injurious concentration being approximately 0·1 per cent.

HEINICKE (A. J.), BOYTON (D.), & REUTHER (W.). **Cork experimentally produced on Northern Spy Apples.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 47–52, 2 figs., 1940.

An experiment is described in which a healthy, 27-year-old Northern Spy apple tree that had borne disease-free fruits for many years, growing in Dunkirk silty clay loam was subjected to flooding in a basin about 40 ft. in diameter under the tree from August to November, 1938, and April to August, 1939. In June, 1939, the young fruits showed early symptoms of surface cork, and internal corky tissue in the flesh was also present. As the season advanced, scorch became pronounced, and many leaves developed bronzing, purpling, and other deficiency symptoms. Some of the older foliage turned yellow or brown and dropped. A high percentage of the severely corked apples failed to reach normal size, and many fell. Chemical analysis of the leaves showed a reduced percentage of ash in the dry matter, as compared with figures for non-flooded trees. The percentage of boron in the ash and the amount per leaf were lower than in the controls. The potash showed even greater reduction both in percentage of ash and amount per leaf, and the total nitrogen content was low. These results indicate that deficiencies of nutrients in the tissues are not necessarily due to deficiency of the elements in the soil. If soil conditions are such that the roots cannot function properly, especially if the oxygen content is low, nutrients are taken up in smaller quantities than normal.

MOORE (R. C.). **A study of the inheritance of susceptibility and resistance to Apple cedar rust.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 242–244, 1940.

In apple-breeding work carried out at the Virginia Agricultural Experiment Station the following information was obtained on the inheritance of susceptibility and resistance to apple cedar rust [*Gymnosporangium juniperi-virginianae*]. Analysis of records for a single year indicate that the factor for resistance or susceptibility was inherited and that there was a segregation of the progenies of crosses into resistant and susceptible types. It also appeared that resistance might be dominant over susceptibility. The Arkansas Black apple variety seemed to behave as a homozygous dominant for resistance, whereas Jonathan and Rome Beauty appeared to be homozygous recessives for susceptibility. Of the other parent varieties used in the crosses, Delicious, Rolls Seedling, Winesap, and Virginia Beauty, though phenotypically resistant, appeared to be heterozygous in resistance or susceptibility. Inheritance of resistance apparently involved only one genetic factor (though this was not finally established), and degree of susceptibility of parent varieties seems to manifest itself in the respective progenies.

DA LUZ (C. G.). **Notas sôbre a Botryosphaeria ribis.** [Notes on *Botryosphaeria ribis*.]—*Agron. lusit.*, i, 4, pp. 361–371, 1 pl., 1939. [English summary. Received May, 1940.]

Details are given of a series of inoculation experiments carried out at the National Agricultural Experiment Station of Portugal with pure cultures of *Botryosphaeria ribis* originally isolated from lemon trees

affected by gummosis in Madeira (*Rev. agron., Lisb.*, xxiv, pp. 124–134, 1936). As shown by previous workers, the size of the fructifications varies with the thickness of the infected bark, these organs being frequently unilocular in young twigs. The pycnospore dimensions varied from 11·7 to 19·5 by 4 to 6·2 μ on inoculated damson to 13·6 to 25·3 by 4·3 to 6·6 μ on pear. Macro- and micropycnidia were observed within the same stroma, and in a few cases macro- and micropycnospores occurred in the same pycnidium. A small number of pycnidia from the inoculated damsons were found to contain biseptate, hyaline, later light brown spores of the same shape and dimensions as the normal organs, which were also present. Subcultures from apple and damson on a slightly alkaline potato starch paste imparted a vivid pink coloration to the substratum after four days' growth.

HATTORI (S.) & KINOSHITA (S.). **Über Wirkstoffe, die von einem auf Prunus Hexenbesen erzeugenden Pilz Taphrina cerasi sezerniert werden.** [On the active substances secreted by the fungus *Taphrina cerasi* causing witches' broom on *Prunus*.]—*Bot. Mag., Tokyo*, liv, 638, pp. 58–63, 2 figs., 1940. [Japanese, with German summary.]

In a study on witches' broom of cherry (*Prunus yedoensis*), the action of ether extracts from pure cultures of the causal fungus, *Taphrina cerasi* [*R.A.M.*, vi, p. 427], on *Avena* seedlings was examined. For this purpose germinating *Avena* grains were placed on blotters soaked in saturated solutions of the extract diluted with water four or ten times. The root growth of the seedlings was strikingly retarded, whereas the growth of the coleoptile was apparently not affected. The *Taphrina* extract was shown to exert a more powerful effect on the roots than heteroauxin but had less effect on the coleoptiles than the latter. It is accordingly considered to be distinct from heteroauxin.

RASMUSSEN (E. J.). **The effect of several spray materials on the size, color, and per cent. solids of the fruit of the Montmorency Cherry.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 367–370, 1940.

In the last few years proprietary copper compounds have been developed which have proved more successful than lime-sulphur in the control of sour cherry leaf spot [*Coccomyces hemalis*: *R.A.M.*, xix, p. 199] in Michigan, and the value of these materials depends on the effect they produce on the physiological activity of the plant, as well as on their ability to control infection. The author describes experiments which showed that Montmorency cherry trees sprayed with Bordeaux mixture at concentrations of 4–6–100 and over gave cherries which were darker, smaller, and higher in total solids than those from trees sprayed with lime-sulphur. Trees sprayed with weak concentrations of Bordeaux mixture and with proprietary copper materials (including cupro-K, basicop, and coposil) produced cherries which were somewhat darker and were higher in total solids than cherries from trees sprayed with lime-sulphur, but were about the same size as the latter. Evidence was also obtained that the increased transpiration induced by Bordeaux mixture was responsible for the increased drought injury that occurred at East Lansing during the dry and hot season of 1939.

MURPHY (L. M.). **The effect of certain fungicides on the photosynthetic activity of Sour Cherry leaves.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 375–378, 1940.

The author presents experimental data demonstrating that in point of photosynthetic efficiency (as measured by the dry weight increment of the leaves) cupro-K is superior to coposil, Bordeaux mixture, and lime-sulphur as a spray for sour cherries against leaf spot (*Coccomyces hiemalis*) [see preceding abstract].

POTTER (J. M. S.). **Lessons from the Wisley fruit trials.—III. Yellow edge of Strawberries.**—*J. R. hort. Soc.*, lxv, 8, pp. 256–260, 1940.

In the official fruit trials at Wisley, healthy and fruitful stocks of all varieties of strawberries, free from yellow edge [*R.A.M.*, xix, p. 481], were maintained by the combined effect of the following methods. Varieties highly susceptible to the disease (including Aromatic, Campbell's Seedling, Redbourn, and Sir Joseph Paxton) were segregated from those showing no symptoms (including American Seedling, Corvallis, Duchess of Kent, Ettersberg 121, Huxley Giant, Oberschlesien, Pillnitz, and Tardive de Léopold) but carrying the virus in a masked form and being, therefore, potential carriers of infection. The two groups were planted separately on plots, isolated from one another by at least half-a-mile. It had been observed that as the plants grow older, an increasing number of runners succumb to yellow edge, and it was decided, therefore, to grow the plants for one year only, and propagate annually. Propagation was restricted to five runners for each plant and the planting distance was 18 in. between the plants and 2 ft. between the rows (2 ft. by 2 ft. 6 in. for Corvallis). Apart from these cultural measures, mites were controlled by spraying with lime-sulphur (1 in 30) at the end of March, nicotine being added if aphids were observed. One or rarely two more applications of standard nicotine wash against aphids might be necessary. After the fruit was gathered, dead foliage was removed and the plants sprayed again prior to layering the runners. Dusting with a nicotine dust (4 per cent.) proved effective in hot and dry weather only.

WARDLAW (C. W.). **Banana diseases. XIII. Further observations on the condition of Banana plantations in the Republic of Haiti.**—*Trop. Agriculture, Trin.*, xvii, 7, pp. 124–127, 5 figs., 1940.

A further visit to Haiti made eighteen months after the previous one in 1938 showed that the condition known as 'plant failure' of bananas [*R.A.M.*, xviii, p. 327] is present in an acute form in many areas, a majority of the plantations showing a preponderance of mediocre to poor fruit. In some localities the disease has become much aggravated since 1938, while in others the standard of production has declined. Most of the privately owned plantations round Cap Haitien and Plaine du Nord are now incapable of yielding fruit for export, owing to lack of irrigation, 'plant failure', and the presence of Sigatoka disease (*Cercospora* [*musae*: loc. cit.]) in its final epidemic form. In many instances the growers fail to appreciate the true causes of their failure.

The outlook for the banana industry in Haiti for the next few years does not warrant optimism. In descending order of importance the

main problems are (*a*) the economic solution of the problem of plant failure, (*b*) all-round improvement in cultivation, (*c*) control of *C. musae*, and (*d*) restricting the spread of Panama disease [*Fusarium oxysporum cubense*: loc. cit.]. The first two are both related to adequate production, without which the cost of controlling *C. musae* and meeting other contingencies cannot be met, and the author considers that until (*a*) is achieved it will remain inadvisable to attempt large-scale banana cultivation in Haiti.

New symptoms of 'plant failure' noted include destruction of the leaves, rotting of the leaf sheaths at the 'throat' or crown, and the dropping-out of bunches, resulting from failure of the softening petiole bases to give normal support. Affected plants also acquire a leaning position. That the destruction of the rootlet system is responsible for 'plant failure' may now be provisionally accepted. This destruction is probably due to some chemical factor.

Alkali chlorosis is still conspicuously present at Delugé and in small areas throughout the island; these unproductive places should be abandoned, though very good bananas may quite well be grown in the near vicinity.

A survey of the distribution and intensity of *C. musae* showed it to be in evidence everywhere, intensity ranging from light, general infection to very severe leaf scorching. In some areas the environmental conditions appear to delay the progress of infection or to reduce its intensity, but judging from the severity of the disease even in the more favoured localities it would seem that control measures will in time be necessary, at least during certain months. Treatment with copper-lime dust has proved moderately effective, but later on spraying with Bordeaux mixture or some other copper-containing material will probably become necessary. In certain private plantations near Cap Haitien and Plaine du Nord, where no control is practised (except for leaf pruning, which is ineffective) prematurely ripening bunches are evident and such fruit should not be used for export. Under present conditions it seems doubtful whether the cost of controlling *C. musae* will prove economically possible.

A minute brown spotting widely and profusely distributed on green leaves of Gros Michel bananas should be kept under observation.

Panama disease is definitely increasing in the Artibonite district, and a localized but severe outbreak was observed at Delugé. Near Jacmel the position is serious, and treatment appears to have been abandoned, though the conditions on the light alluvial soils in this locality favour spread.

'Moko' disease (*Bacterium solanacearum*) [ibid., xviii, p. 328] is widely distributed on the moko, bluggoe, or probon plantain in the Artibonite district.

Virus heart rot [loc. cit.] is prevalent. When the heart rot condition accompanying the leaf mottling is very marked, the plant is unable to yield commercial fruit, and the disease can be as destructive to the individual plant as is Panama disease. Infected stools should be eliminated by gas oil treatment.

Bananas in the Port-de-Paix area have shown a considerable amount of spotting or 'pitting' on the cushions and finger stalks, spotting dis-

tributed over the fingers, and lesions on the main stalk. The condition appears to be identical with 'pitting disease' associated in Brazil and Trinidad with various fungi, including *Piricularia grisea* [ibid., xvi, p. 195] and *Helminthosporium torulosum* [ibid., xix, p. 158].

MEHTA (P. R.). **Stem-end rot and soft rot of Pineapple in the United provinces.**—*Curr. Sci.*, ix, 7, p. 330, 1940.

Pineapple fruits purchased at the Cawnpore market showed the presence of stem-end rot, caused by *Ceratostomella paradoxa*, a fungus widely distributed in India, but where only once before (in 1939) has it been observed to attack this crop. The fruits came from the Gorakhpur district in the United Provinces, where the pineapple has been cultivated for the past few years. The symptoms are described and notes on control measures in other countries given.

RANJAN (S.) & JHA (V. R.). **The effect of ethylene and sulphur dioxide on the fruits of Mangifera indica.**—*Proc. Indian Acad. Sci.*, Sect. B, xi, 6, pp. 267–288, 1 pl., 13 graphs, 1940.

A detailed account is given of the authors' studies at the University of Allahabad on the physiology of black tip of mango in relation to ethylene and sulphur dioxide, two of the chief noxious constituents of the blast furnace gas used in brick kilns in the vicinity of the damaged fruits [*R.A.M.*, xviii, p. 329]. The respiratory rate was accelerated and the sugar content increased when the fruits were subjected to treatment with an ethylene-air mixture (1 : 1,000 dilution), the effects becoming noticeable after an induction period of not less than 15 hours, but the total acid content remained unchanged. The treated mangoes generally became soft and yellow. Protracted exposure to the ethylene-air mixture induced typical black tip symptoms (after 7 and 10 days, respectively, at 1 : 500 and 1 : 1,000).

Sulphur dioxide (1 : 1,000) also caused a gradual rise in the respiratory rate, and the treated mangoes underwent extensive disorganization, the mesocarp becoming pulpy, brownish, and malodorous.

Four mangoes placed in a chamber through which a mixture of air with 0·1 per cent. ethylene and 0·01 per cent. sulphur dioxide was passed developed distal blackening, the symptoms appearing on the sixth day and reaching a climax on the tenth.

BAKER (R. E. D.), CROWDY (S. H.), & MCKEE (R. K.). **A review of latent infections caused by Colletotrichum gloeosporioides and allied fungi.**—*Trop. Agriculture, Trin.*, xvii, 7, pp. 128–132, 3 figs., 1940.

In reviewing the progress of investigations on latent infection by *Colletotrichum gloeosporioides* [*R.A.M.*, xix, p. 294] and allied species, the authors state that numerous isolations of *C. gloeosporioides* made from grapefruit and papaws fell into three groups: (1) those with orange-pink conidial masses and little or no aerial mycelium, (2) those with fewer, more irregular conidia, dark stromatic growths, and more aerial mycelium, and (3) those producing the perithecia and asci of *Glomerella cingulata* [ibid., xi, p. 382] in culture. While all 'species' of *Colletotrichum* producing *G. cingulata* as the perfect stage must be

regarded as strains of this organism, many isolations of *C. gloeosporioides* never produce setae in culture, and only occasionally form them in natural media on old lesions; in all other respects, however, they are identical with *Gloeosporium musarum*, and doubtless the two species are frequently confused. Isolations indistinguishable from *C. gloeosporioides* were made from cacao, and it seems clear that the cacao anthracnose species, including *C. incarnatum* [ibid., v, p. 159], *C. theobromae*, *C. theobromicola*, *C. luxificum* [ibid., xiv, p. 566], and *C. cradwickii* [ibid., xi, p. 701] require further investigation. It may be that anthracnose of many tropical fruits is due to strains of *Gloeosporium* and *Colletotrichum*, all of which belong to *Glomerella cingulata*.

Experiments demonstrated that *C. gloeosporioides* germinates slowly in pure water, but that germination is accelerated if a nutrient is added to the infection drop. The conidia were highly sensitive to atmospheric humidity, germination being virtually inhibited at relative humidities under 95 per cent. On slides over calcium chloride the spores were no longer viable after about 70 hours. When mango fruits were inoculated with conidial suspensions an initial period with relative humidity at or near saturation point was essential for infection, but it was not necessary for this period to persist for more than 12 hours, provided the fruits were not immediately subjected to abnormally dry conditions. On full green papaws infections were established after 24 hours in a saturated atmosphere, while on young fruits heavy infections were established only after 42 hours, light infections occurring after 12. When a young fruit was inoculated with a suspension of spores in 2 per cent. malt, low infection occurred after 12 hours and heavy after 18. Appressoria developed equally quickly on young and old fruits. Young mango fruits became infected as readily and as rapidly as old papaw fruits, but old mangoes were less readily infected, their behaviour corresponding closely to that of young papaw fruits. On mangoes infection reached maximum intensity when the fruit was about half developed, and then declined [ibid., xix, p. 611].

It is concluded that the question of stomatal or cuticular penetration still requires elucidation, that the rate of exosmosis of nutrients from fruit of different ages appears to be important, and that the nature of the resistance of young papaws and old mangoes should be studied. The fact that latent infection is able to develop further when the fruit begins to ripen or reaches a certain stage of senescence is assumed to be due to chemical changes in the fruit tissues.

NATTRASS (R. M.). **Further notes on the 'woodiness' disease of Passion Fruit in Kenya.**—*E. Afr. agric. J.*, vi, 1, p. 54, 1940.

In the Sotik district of Kenya, woodiness disease of passion fruit shows different symptoms from those observed in Trans Nzoia [*R.A.M.*, xix, p. 107]. In the former locality, the foliage remains almost unaffected, or in severe cases is affected only for a very brief period, though the effect on the fruit is well marked. Affected vines occur sporadically throughout a plantation. Fruits on a single dropper only may be attacked, and woody and normal fruits may be found on the same dropper. Occasionally, only one side of the vine is affected. The

whole fruit may be distorted, with large swellings, corresponding to areas of woody tissue, or it may be reduced to a small, spherical mass of hard, woody tissue, the internal cavity having almost completely disappeared. One of the earliest signs of attack is the presence of one or more round, yellowish spots, up to $\frac{1}{4}$ in. in diameter, on the surface of the green fruit; these spots are difficult to cut, and indicate the position of the woody tissue.

Attempts to transmit the Sotik form of the disease by inoculating healthy seedlings with juice and crushed tissue from affected plants failed, though the Trans Nzoia type was readily transmitted by this method. When, however, cuttings from affected vines at Sotik were grown on their own roots at Nairobi they produced woody fruit and the disease was successfully transmitted to two healthy vines by inarching, and from these vines again to others by the same method. The evidence indicates that the Sotik disease is also caused by a virus, but is less readily transmissible than the Trans Nzoia type, and is probably not spread on the workers' hands or on pruning knives. Few plantations are, however, completely unaffected.

To control the Sotik type of woodiness it is recommended that directly a plantation comes into bearing it should be frequently inspected and all affected vines destroyed, the gaps being promptly replanted. Seedlings for replanting should be raised in a distant, isolated spot. Seed from woody fruits produces healthy plants.

Horsfall (J. G.), Heuberger (J. W.), Sharvelle (E. G.), & Hamilton (J. M.). **A design for laboratory assay of fungicides.**—*Phytopathology*, xxx, 7, pp. 545–563, 1 diag., 3 graphs, 1940.

A detailed account is given of co-operative studies at the Connecticut, Minnesota, and New York (Geneva) Agricultural Experiment Stations on the possibilities of a refinement in the existing methods of the laboratory appraisal of fungicides [*R.A.M.*, xviii, p. 754], using as a test organism *Macrosporium* [*Stemphylium*] *sarciniforme*, a pathogen of red clover (*Trifolium pratense*), which at 20° C. readily forms large, black spores with hyaline germ-tubes on oat agar.

In order to convert precise concentrations of a given fungicide into equally precise deposits on the treated surface a precision sprayer is required, with a de Vilbiss atomizer No. 15 nozzle. The target, consisting of a 3 by 1 in. glass microscope slide, coated with cellulose nitrate, was fixed at the opposite end of a cylinder 30 by 4 in., the spray stream thus enclosed undergoing no deflexion by stray air currents. Since the spray tended to evaporate and lose its load of toxicant at low air humidities, the cylinder was placed inside a hood where the dew point could be controlled by varying the humidity. The deposit of spray fluid on the slide per unit of time was regulated by changing the size of the hole in the atomizer end of the tube. It was necessary to maintain a constant distance between the target and the atomizer and the atomizer and the level of spray in the container since deposition varied inversely with these distances, while the spore concentration was held constant at 5,000 per c.c. by the use of a haemocytometer. A Breed eyepiece micrometer was found to facilitate counting.

It is necessary to determine the resistance level of the test spores to a standard Bordeaux mixture. For example, exposures of 3, 5·5, and 8 seconds gave deposits of 0·096, 0·176, and 0·256 mg. copper per sq. cm. sprayed surface, with spore inhibition percentages of 8, 35, and 57, respectively. The LD 50 (lethal dose for 50 per cent. of the spores) [ibid., xvii, p. 540] or resistance level in this experiment was at 0·221 mg. per sq. cm., or 0·00039 mg. per spore.

The preparation of the standard LD 50 Bordeaux is described and a coefficient calculated to measure the relative fungicidal value of the test material, namely, the quotient obtained by dividing the quantity of copper in Bordeaux necessary to give LD 50 by the quantity of copper in the unknown essential for the same purpose. The Bordeaux coefficient provides a correction for oscillations in the resistance level of the spores and enables the investigator to compare materials tested on different days.

HOWARD (F. L.). **The value of testing fungicides in the laboratory before use in the field.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 409–414, 1940.

For evaluating the efficiency of potential fungicides [see preceding abstract] the author adopted the methods developed by McCallan, using glass slides. In addition tests were also carried out on living leaves as a substratum. The fungi used in the tests were chiefly peach brown rot (*Monilinia* [*Sclerotinia*] *fructicola*) and tomato early blight (*Alternaria solani*). The result of the tests recorded showed that commercial brands of 'dry' Bordeaux mixture and of some 'insoluble' copper fungicides differed widely in their toxicity to *S. fructicola*, but all, when used at the dilution recommended by the manufacturers, were less toxic than Bordeaux mixture; at double strength, some were approximately as effective as Bordeaux mixture. Liquid lime-sulphur (2–100) was less toxic to *S. fructicola* than Bordeaux mixture. Two commercial brands of dry lime-sulphur showed widely different toxicity to the fungus. In tests with *A. solani* the toxicity of Bordeaux mixture appeared to be sharply reduced when the dilution was greater than 5–5–50. Some 'dry' Bordeaux mixtures did not materially reduce spore germination. Malachite green and some other organic dyes at great dilutions were strongly fungicidal to spores of *A. solani*.

The results showed that reputedly similar commercial fungicides may vary in toxicity. The author considers there is need for the establishment of biological standards of toxicity in addition to the statement of chemical composition.

WEBER (A. L.) & MCLEAN (H. C.). **The effect of lime and weathering upon lead arsenate and copper spray mixtures.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 391–396, 1940.

In laboratory experiments on the effect of lime and weathering upon lead arsenate and copper spray mixtures (including cupro-K, basicop, coposil, ZO, copper hydro, and Bordeaux mixtures), it was found that lead arsenate usually reduces the water-solubility of the copper in the mixtures, but in the case of cupro-K and Bordeaux mixture 2–1–50 it is increased, while no effect is evident with Bordeaux mixtures 1–3–50,

1-4-50, and 2-2-50. The effect of lime on water-soluble copper varies according to the type of copper compound and to the presence or absence of lead arsenate. With coposil and copper hydro, the addition of lime causes a large increase in water-soluble copper but in others lime caused a decrease in soluble copper. As a rule copper compounds have a tendency to decrease the solubility of the arsenate. When a film of mixture was exposed to the atmosphere for two weeks, the presence of lime caused a much larger increase in water-soluble arsenic than occurred in its absence, a result due to the carbonization of the lime. Only in the case of cupro-K was there no increase in the water-soluble copper in the absence of lime. These results indicate that it is not the original content of water-soluble copper and arsenic but the effect of the atmosphere that causes the heavy metals of the spray mixture to change to an injurious form.

BURKHOLDER (C. L.), HIENTON (T. E.), & REED (M.). **Ten years of operation cost records on stationary spray equipment.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 401–403, 1940.

In comparative tests during 1930, 1931, 1933, and 1934 the cost of spraying apples with a portable sprayer was \$1·50, 0·73, 0·76, and 0·70 per 100 gals. spray, respectively, the cost including labour, power, interest on investment, and depreciation, but not materials, the corresponding costs for spraying with stationary spray equipment being \$1·30, 0·70, 0·50, and 0·56 per 100 gals. In 1935, the area sprayed hitherto with portable apparatus was fitted with stationary plant and the application cost reduced to 36 cents per 100 gals., the corresponding cost in 1936, 1937, 1938, and 1939 being 55, 38, 41, and 40 cents, respectively, an average for the five-year period of 42 cents. In another orchard a stationary spray plant serving 200 acres gave over a nine-year period a corresponding figure of $26\frac{1}{3}$ cents.

BRUNO (A.). **A new formula for a copper mixture.**—*C. R. Acad. Agric. Fr.*, xxvi, pp. 454–457, 1940. [French. Abs. in *Chem. Abstr.*, xxxiv, 15, p. 5236, 1940.]

The following formula is stated to produce a much more readily dispersible mixture than those prepared with milk of lime or sodium carbonate: dissolve 1 kg. copper sulphate in 50 l. water and 1,250 to 1,300 gm. sodium orthophosphate in 20 to 30 l., make up to 100 l., and stir.

HOFFMAN (C.), SCHWEITZER (T. R.), & DALBY (G.). **The effect of chlorine substitution on the fungistatic properties of acetic and propionic acids.**—*J. Amer. chem. Soc.*, lxii, 4, pp. 988–989, 1 graph, 1940.

Tests were carried out at the Ward Baking Company, New York, to determine the effect of chlorine substitution on the toxicity of acetic and propionic acids to [food-contaminating] fungi [*Aspergillus niger*, *A. glaucus*, *Rhizopus nigricans*, and *Penicillium frequentans*: *R.A.M.*, xix, p. 296]. β-chloropropionic acid has a fungistatic curve practically identical with that of propionic acid itself and differing markedly from the β-iodopropionic acid curve. The introduction of chlorine on the

alpha carbon atom of propionic acid sharply reduces its fungistatic properties. Monochloracetic acid is also much less effective than acetic except in the very high P_H ranges. A chlorine atom on the carbon atom adjoining the carboxyl group thus affects the fungistatic properties of an acid, whereas the same substituent on a beta carbon atom has no influence.

The relative fungistatic properties of acetic and monochloracetic, and of propionic and α-chloropropionic acids, when compared with their respective dissociation constants, are in agreement with the widely held theory that the biological activity of an acid is dependent on the dissociation constant. This relationship is not so close, however, in the case of propionic and β-chloropropionic acids, which exert essentially identical fungistatic effects with dissociation constants of $1{\cdot}33 \times 10^{-5}$ and $8{\cdot}59 \times 10^{-5}$, respectively.

BROWN (W.). **Plant disease in relation to the public.**—*Nature, Lond.*, cxlvi, 3691, pp. 118–121, 1940.

This is a report of a Chadwick Public Lecture delivered by the author on 20th June, 1940. He discusses in popular terms various, chiefly economic, aspects of plant disease and indicates lines on which further progress in disease control is to be sought.

WHITE (D. E.). **The chemistry of fungus and bacterial pigments.**—*Aust. chem. Inst. J. Proc.*, vi, 8, pp. 313–330, 1939.

This is a critical, fully documented survey of outstanding recent contributions to the study of the pigments produced by micro-organisms. The characteristics of the various products are briefly described, and notes are also given on the relatively few bacterial pigments known up to the present.

PRICE (W. C.). **Comparative host ranges of six plant viruses.**—*Amer. J. Bot.*, xxvii, 7, pp. 530–541, 6 diags., 1940.

The experiments described in this paper were started on the assumption that a comparison of the host ranges of several plant viruses might lead to a knowledge of the specific chemical or physical properties required by the viruses for reproduction. Plants belonging in a large number of families were tested for susceptibility to six different viruses and the results are tabulated on pp. 531–536. It was found that tobacco necrosis virus [*R.A.M.*, xviii, pp. 540, 555; xix, p. 370] infected 88 species in 37 families but failed to infect 25 species in 13 of these and 28 species in 20 others; tobacco ring spot virus infected 143 species in 40 families but failed to infect 14 species in 13 of these and 21 species in 16 others; tomato ring spot virus infected 54 species in 35 families but failed to infect 17 species in 12 of these and 29 species in 20 others; cucumber mosaic virus infected 191 species in 40 families but failed to infect 21 species in 12 of these and 25 species in 19 others; cucurbit mosaic virus [cucumber virus 4: ibid., xvii, p. 647] infected 5 species in one family but failed to infect 107 species in 52 other families; and lucerne mosaic virus [ibid., xix, p. 563] infected 92 species in 28 families but failed to infect 16 species in 12 of these and 43 species in 28 others. These results indicate that conditions requisite for the multiplication

of the virus in the plant tissue is a characteristic of the species itself and has little or no relationship to the taxonomic position of the family. The only exception among the viruses tested seems to be cucumber virus 4, which has a very narrow host range, being restricted to certain species in the Cucurbitaceae.

Lea (D. E.). **Determination of the sizes of viruses and genes by radiation methods.**—*Nature, Lond.*, cxlvi, 3691, pp. 137–138, 1940.

A radiation method for the determination of the size of the virus particle and other biological entities of subcellular size is described, based on the results of previous work, in which it was found that a particle of virus or phage can be inactivated by exposure to ionizing radiation such as X-rays, α-rays, or β-rays [cf. *R.A.M.*, xix, p. 370]. It was seen that the dose of radiation needed for inactivation corresponds to one ionization in a volume equal to the volume of the virus particle, and furthermore, that the inactivation is of the nature of a single unit process. The results of some preliminary experiments with X-rays showed that the value for the diameter of the virus of tobacco necrosis determined by radiation (14 to 19 mμ) was in good agreement with the value deduced from ultrafiltration experiments (12 to 20 mμ) [cf. ibid., xv, p. 672].

Timonin (M. I.). **The interaction of higher plants and soil micro-organisms. I. Microbial population of rhizosphere of seedlings of certain cultivated plants.**—*Canad. J. Res.*, Sect. C, xviii, 7, pp. 307–317, 1 fig., 2 graphs, 1940.

In greenhouse experiments in Canada with seedlings of wheat, oats, lucerne, and peas, it was found by the use of the plating method that the number of bacteria and Actinomycetes was 7 to 71 times greater in the rhizosphere of these plants than in the soil distant from the roots [*R.A.M.*, xix, p. 488]. In the case of fungi the increase was not considerable, only 0·75 to 3·1 times, but this is possibly due to the discrepancies of the plating method when applied to fungi. Generally, fungi were more numerous in the rhizosphere of oats, and bacteria in that of lucerne. Seventeen genera of fungi were represented in isolates from the rhizosphere and soil distant from the roots, including *Aspergillus niger*, *A. versicolor*, *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*], *Fusarium* spp., *Gliocladium roseum*, *Mesobotrys* spp., various species of *Penicillium*, and *Spicularia terrestris* n.sp., the last-named from the rhizosphere of lucerne. There was no significant difference in the fungal population isolated from the rhizosphere of the different plants, or between the rhizosphere and the soil distant from the roots.

Hamada (M.). **Physiologisch-morphologische Studien über Armillaria mellea (Vahl) Quél., mit besonderer Rücksicht auf die Oxalsäurebildung. Ein Nachtrag zur Mykorrhiza von Galeola septentrionalis Reichb. f.** [Physiological and morphological studies on *Armillaria mellea* (Vahl) Quél., with special reference to oxalic acid formation. An addendum to the mycorrhiza of *Galeola septentrionalis* Reichb. f.]—*Jap. J. Bot.*, x, 4, pp. 388–463, 1 pl., 8 figs., 4 diags., 3 graphs, 1940.

The development of nine strains of *Armillaria mellea*, including

three symbionts of *Galeola septentrionalis* and one of *Gastrodia elata* in the Kyoto district of Japan [*R.A.M.*, xix, p. 35], was found to proceed most actively on nutrient decoctions, especially soy sauce agar, while the secretory reactions were powerfully stimulated by synthetic media, such as glucose-peptone agar.

A. mellea in nature and on nutrient media gives rise to two types of rhizomorphs: (*a*) a flat, wrinkled, mostly white form, *Rhizomorpha subcorticalis*, and (*b*) a smooth, cylindrical, and more or less black form, *R. subterranea*. In addition, somewhat friable 'brown membranes' composed of one or two superficial, brown, sclerenchymatous cell layers and some underlying white ones are formed on the surface of the media and can be considered a form of *R. subterranea* [ibid., xiii, p. 483]. The development of rhizomorphs and brown membranes was found to depend largely on the nitrogen (peptone): carbon (glucose) ratio of the substratum, attaining a maximum at 1 : 4. Secretory reactions influenced by this factor are luminescence, guttation, and calcium oxalate crystal production, the two first-named being most in evidence at 1 : 1 and the last-named at 1:4. Yeast agar media favour the development of the *R. subterranea* type of rhizomorph, while the *R. subcorticalis* form [loc. cit.] is produced by soy sauce agar. The possibility that these media contain growth substances stimulating the distinctive forms of development associated with them is briefly discussed, and in this connexion the virtual inability of *A. matsutake* [ibid., xv, p. 684] to grow on soy sauce is mentioned as pointing to a more complex relationship between growth-promoting and growth-inhibiting factors than would appear from Fries's work [ibid., xviii, p. 335].

The various strains under observation fall into certain definite categories characterized by rhizomorph formation, aerial mycelium production, luminescence, and so forth. The fact that the symbionts of *G. elata* and *Galeola septentrionalis* possess the characters of *A. mellea* in varying degrees is regarded as a further argument in favour of their wholesale inclusion within the species.

The shapes of the calcium oxalate crystals produced in culture or on the hyphae are largely dependent on the quantities of peptone added to the medium, pyramidal structure resulting from an abundance and prisms from a shortage of this substance.

Evidence is adduced that the symbiont is unable to lead an entirely normal and independent existence even in the 'fungus-host layer' (the outer root cortex), its movements being governed to a very considerable extent by seasonal variations in the activity of the host.

COCKERHAM (G.). **Virus diseases and seed Potatoes.**—*Advanc. Sci. (Quart. Rep. Brit. Ass., 1939)*, i, 2, p. 313, 1940.

Since the introduction in 1932, by the Department of Agriculture for Scotland, of a scheme whereby virus diseases are taken into consideration in grading potato crops for seed purposes, a steady improvement in the health of Scottish stocks has resulted. Nevertheless, virus diseases still continue to harass the Scottish seed potato industry, a particularly serious problem being the ubiquity of potato virus X [*R.A.M.*, xviii, p. 408]. This virus is independent of insect vectors for dissemination, and the environmental advantages for potato seed production

offered by the greater part of Scotland do not come into play. Consequently a large acreage of potatoes has to be graded H, which in the absence of virus X would have been graded A. It is suggested that the replacement of varieties tolerant to this virus by intolerant or 'field-immune' ones may provide a solution to the problem.

SILBERSCHMIDT (K.). **Progressos e projetos em torno da produção de tuberculos-sementes de Batatinha em S. Paulo.** [Progress and plans in respect of the production of Potato seed tubers in S. Paulo.]—*Biologico*, vi, 7, pp. 173–179, 4 figs., 1940.

Particulars are given of the progress to date and future plans in regard to the scheme already described for the production of virus-free seed potatoes in Brazil [*R.A.M.*, xix, p. 234, where the country was given in error as the Argentine and the indigenous stocks (l. 43) referred to were Argentine stocks]. The project is organized on a co-operative basis by some 30 growers with properties situated at an altitude of 1,000 m. or above in the region of São João de Bôa Vista. About half the seedlings raised from the 2,000 boxes of Eigenheimer and Bintje seed imported from Holland developed unmistakable symptoms of virus infection, necessitating drastic roguing and convincing the farmers of the urgent need for the establishment of plantings for the production of indigenous seed stocks. In this connexion the methods adopted in various countries for the realization of this object are described and their application to local conditions discussed.

JONES (L. K.), VINCENT (C. L.), & BURK (E. F.). **The resistance of progeny of Katahdin Potatoes to viroses.**—*J. agric. Res.*, lx, 9, pp. 631–644, 5 figs., 1940.

In further variety trials on the resistance of potatoes to virus diseases [*R.A.M.*, xvi, p. 828], veinbanding or Y virus was found to reduce the tuber yields of the U.S.D.A. 46000, Earlaine, and Houma varieties by 75, 58, and 72 per cent., respectively, in the second season following 100 per cent. infection by the virus, and that of Katahdin only by 5 per cent. None of the seedling lots showed immunity from mechanical inoculations with the Y virus; some were completely susceptible and others somewhat resistant. Some resistance was consistently exhibited by seedling lots grown from seed of which Katahdin was a parent. Katahdin selfed seedlings showed 54 per cent. resistance, but higher resistances were obtained by crossing Katahdin with Ackersegen, Imperia, Sebago, and U.S.D.A. 41956. The results of field tests showed that mechanical inoculation with the Y virus in the greenhouse, although it appears to indicate the relative susceptibility of seedling lots, does not record the limit of their susceptibility since greater susceptibility was observed from natural infection in the field. Only seedlings having Katahdin as a parent showed resistance to veinbanding in the field, this resistance being insignificantly increased by crossing Katahdin with other varieties. When potato tubers were planted in the same planting with seedlings, many varieties became 100 per cent. infected with veinbanding in two years, while seedlings 46842 and 47208 showed none, Katahdin showed 12·9, and several other varieties less than 32 per cent. infection. The results of tests with single-drop tubers showed that selfing Earlaine or

crossing it with Katahdin or U.S.D.A. 41956 gave seedlings of reduced resistance to the Y virus as compared with those obtained from selfing Katahdin or crossing it with No Blight or U.S.D.A. 41956. Observations on the seedlings grown in the greenhouse from seed collected from veinbanding-affected plants failed to give any indication that the Y virus is seed-transmitted.

A serious disease appeared in the potato planting in 1938 and 1939, characterized by dwarfing and erectness of the plants, rolling, harshness, and reddening of the foliage and increase in the number of tubers. Healthy tomato scions grafted on affected potato plants developed typical symptoms of tomato curly dwarf caused by the beet curly dwarf virus to which the potato disease is attributed. There was no significant difference in varietal susceptibility to the virus, although there was some indication that possibly Katahdin and its progeny were more susceptible than other varieties.

Plants of Rural New Yorker No. 9 and seedlings from crosses of Early Northern × McCormick and Irish Cobbler × Keeper were susceptible to mechanical inoculation with tobacco mosaic virus, while all the other varieties tested, including Katahdin and its crosses, were immune. Selfed Katahdin seedlings were susceptible to infection by the tobacco mosaic virus through grafts with mosaic-affected tomato scions, but the virus was not transmitted through tubers collected from affected plants. Katahdin was immune from infection by mechanical inoculation with the X virus from Russet Burbank and Green Mountain, but was susceptible to a variant of the virus from Potato Seedling 2277.

ESBO (H.). **Potatisens degenerationsjukdomar.** [Potato degeneration diseases.]—*Medd. Frökontrollanst. Stockh., 1940*, 15, pp. 63–70, 1940. [German summary.]

Notes are given on the symptoms, economic importance, time of appearance, incidence, agent, equivalent foreign names, and mode of transmission of the potato virus diseases, mild mosaic, crinkle, aucuba mosaic, streak, and leaf roll, followed by a discussion on control by the use of clean seed and varietal selection. Magnum Bonum, Erdgold, and Gloria are most widely affected by mild mosaic, Frühgold, Juli, Erdgold, and Gloria by crinkle (King Edward invariably suffering from paracrinkle), and Marius, Sharpe's Express, Prof. Maercker, Blenda, Aal, Voran, Up-to-Date, and Erstling [Duke of York] by streak. [The abovementioned diseases are not explicitly stated to occur in Sweden.]

CORDNER (H. B.) & WARD (N.). **Germination and decay of Potato sets and tubers in controlled studies with special reference to high soil temperatures.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 874–878, 1940.

As a result of experiments on the storage of Triumph potatoes at temperatures of 70° to 95° F. it has been found that the so-called seed-piece decay of autumn-sown Irish potatoes in Oklahoma at high soil temperatures is not at first a true pathological rot but a physiological disturbance. Treatments favouring oxygen penetration of the tissues, such as cutting the tubers, generally favoured germination at high temperatures, while others which tended to limit the gaseous exchange

encouraged seed-piece decay. Prompt sprouting, especially of whole tubers, reduced breakdown and increased germination. The longer the tubers or sets remain in the soil at high temperature the more likely they are to disintegrate without sprouting. The similar protective value of 'pre-sprouting' against decay caused by a species of *Fusarium* has already been established (McMillan, *J. agric. Res.*, xvi, pp. 279–304, 1919). It is concluded that newly cut sets should prove more satisfactory than whole tubers for autumn crop plantings locally, which are made when soil temperatures are much above the optimum. In spring plantings at lower soil temperatures, however, whole tubers are less subject to decay. As an explanation of their apparently contradictory behaviour it is pointed out that the initial breakdown in the autumn planting develops from within the tubers, whereas in spring planting the causal agent is found in the soil exterior to the tuber.

MÜLLER (A. S.). **La marchitez y podredumbre de Papas causadas por Sclerotium rolfsii Sacc.** [Potato wilt and rot caused by *Sclerotium rolfsii* Sacc.]—*Agricultor venez.*, iv, 45–46, pp. 19–20, 1940.

Sclerotium rolfsii is stated to have caused a reduction of 50 to 90 per cent. in the anticipated potato yield in the Aragua and Carabobo valleys of Venezuela in 1939. The symptoms of the disease are briefly described and improved cultural measures for its control indicated.

SAWADA (K.). **Rice blast disease and manuring 2–9.**—*Agric. Rep. Formosa*, xxxv, pp. 22–31, 111–118, 182–189, 251–259, 383–387, 444–449, 655–656, 1937. [Japanese. Abs. in *Jap. J. Bot.*, x, 4, pp. (62)–(63), 1940.]

Of the three essential fertilizers, nitrogen, phosphate, and potash, only the first named was found in the course of several years' observations in Formosa to affect markedly the development of rice blast [*Piricularia oryzae*: *R.A.M.*, xix, p. 429]. The incidence of infection rose parallel with additional amounts of nitrogen, which induced a decline in the thickness of the leaves and of their epidermal cell walls, coupled with an increase in the number and size of the stomata. Similar abnormalities were detected in the histological structure of the culm nodes, which also underwent a diminution of the sclerenchymatous tissue and a corresponding extension of the soft parenchyma. All these factors naturally impair the resistance of the plants to infection by *P. oryzae*. Before the earing leaves are damaged, the panicles sustain injuries involving a reduction of grain size and extensive sterility.

MURRAY (R. K. S.). **Report of the Botanist and Mycologist for 1939.**—*Rep. Rubb. Res. Bd, Ceylon, 1939*, pp. 48–71, 1940.

In this report [cf. *R.A.M.*, xix, p. 114] the author gives, *inter alia*, the results of field trials of four brands of dusting sulphur against *Oidium* [*heveae*: ibid., xviii, p. 816] on rubber. The brands containing 90 to 95 per cent. sulphur gave the best control, one brand was unsatisfactory, and the fourth, an inexpensive product, was found to have excellent physical and cloud-forming properties largely on account of inert bituminous matter contained in it. This inert matter may prove to be of value in enhancing the adhesive properties of pure sulphur.

The chief fungi found in 1939 on *Hevea* rubber plants killed by root disease in Ceylon were *Fomes lignosus* and *Poria hypobrunnea*, of which the latter was the less common. Maximum loss occurred in the second or third year after planting, after which the fungi concerned appear to become quiescent, even where old infected roots remain in the ground. Reports from estates systematically examining the roots of every plant at periodic intervals showed that the cost ranged from 1·25 to 4 rupees [1*s*. 10½*d*. to 6*s*.] per acre per round. Plants showing an external growth of the fungus, but no penetration of the tissues, are treated by rubbing off the mycelium and swabbing with copper sulphate solution; such plants were found to be quite healthy after four to nine months.

The available evidence indicated that the deterioration and death of covers of *Pueraria phaseoloides* over large areas under mature rubber was due to soil sickness, such as is commonly associated with leguminous crops grown continuously in the same soil. The remedy consists in rotation, and estates have been advised to establish other legumes, to encourage non-leguminous weeds, and to apply fertilizers containing phosphate to healthy covers.

Light, overhead shade was found to give a substantial degree of control of *Helminthosporium heveae* [ibid., xix, p. 115]; spraying with perenox [ibid., xix, p. 260] was also satisfactory in this respect.

Friend (W. H.). **The crow-bar method of applying soil correctives, plant nutrients, and disease inhibiting chemicals about the roots of horticultural plants.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 1080–1083, 1940.

The author draws attention to the possibility of correcting nutritional disorders of plants by using relatively small amounts of chemicals applied in holes punched or bored in the soil surrounding the plant. One pound of material applied in holes within the root zone can be more effective than 5 lb. or more broadcast over the surface soil. The number, depth, and spacing of the holes and the materials used depend on the type and age of the plants, the nature of the soil, and the object of the treatment. In the author's experiments a pointed iron bar made from the drive shaft of a motor truck was found to be effective for punching the holes. The materials may be applied in liquid or granular form; liquid treatment appears to be desirable in treating plants affected with root disease, where prompt action is called for. On very calcareous soils the corrective chemical (such as copperas) should be used with a fixation inhibitor such as sulphur or an acid-forming fertilizer. The evidence also showed that it is desirable to use materials (such as sewage sludge) providing food for the bacteria that expedite the oxidation of the sulphur into sulphuric acid, which is a very effective inhibitor of fixation, a powerful soil solvent, and a preventive of certain soil-borne diseases. In a test on 25 papaw plants, the application of activated sludge plus sulphur to holes resulted in the loss of only one plant from root rot (*Phymatotrichum* [*omnivorum*]), whereas application of sludge without sulphur to a large block resulted in 29 per cent. infection. The data obtained demonstrated that relatively small amounts of materials, applied in acidulated spots or cores, are able to correct a type of chlorosis that is prevalent on the calcareous soils of the Rio Grande delta.

Martin (J. P.) & Waksman (S. A.). **Influence of microorganisms on soil aggregation and erosion.**—*Soil Sci.*, l, 1, pp. 29–47, 1940.

This is a full account of the writers' studies on the part played by micro-organisms in soil aggregation and erosion, a preliminary note on which has already been noticed in this *Review* [*R.A.M.*, xix, p. 115].

Niethammer (Anneliese). **Der Einfluß eines Schwefelkohlenstoff-Präparates auf typische mikroskopische Bodenpilze.** [The influence of a carbon disulphide preparation on typical microscopic soil fungi.]—*Zbl. Bakt.*, Abt. 2, cii, 1–3, pp. 20–24, 1940.

In connexion with her studies on soil micro-organisms at the German Technical College, Prague [*R.A.M.*, xix, p. 566], the writer carried out three series of experiments to determine the effects of a proprietary carbon disulphide preparation on pure cultures of *Trichoderma koningi* [*T. viride*], *Penicillium expansum*, *P. bicolor*, *Fusarium oxysporum*, and *Cladosporium herbarum* in dishes containing 30 gm. steam-sterilized garden soil in a dark chamber at 20° to 23° C., the chemical being applied at the rate of 0·8 gm. per dish (160 gm. per sq. m.). All the fungi gradually ceased growth and eventually died off as a result of the treatment. Used at half the normal strength, the compound tended to stimulate the growth of the three first-named fungi and failed to influence the other two in either direction. The introduction into the dishes of substantial amounts of finely ground cabbage roots and leaves counteracted the fungicidal effects of the carbon disulphide, which exerted only a temporary check on the growth of the micro-organisms.

In dishes containing both a pure culture of *P. expansum* and 50 turnip seeds, only 24 of the latter germinated and their roots were damaged, whereas in those to which carbon disulphide was applied 48 seedlings developed normally. Similar results were obtained with *F. oxysporum*.

Arruda (S. C.) & Deslandes (J.). **A murcha do Mamoneira do nordeste.** [Castor wilt in the north-east.]—*Biologico*, vi, 6, pp. 143–148, 1940.

The species of *Fusarium* responsible for the castor [*Ricinus communis*] wilt previously recorded from São Paulo, Brazil [*R.A.M.*, xvii, p. 65] is stated to have been identified by H. W. Wollenweber as *F. orthoceras* var. *ricini* n. var., further studies on the morphological and physiological characters of which are in progress. [No diagnosis of the variety is given.] In the north-east of the country the crop also suffers from the same disease (20 per cent. infection in a block of plantings at the junction of the rivers Grande do Norte and Potenji), as well as from another form of wilt associated with a collar and root rot caused by *Rhizoctonia* [*Corticium*] *solani*. Soil inoculation tests with sorghum seed or cassava flour cultures of *F. orthoceras* var. *ricini* gave positive results on dwarf and giant varieties of castor after an incubation period of 22 days, the fungus being reisolated from the petioles and stems. Under favourable conditions for the development of the pathogen, such as are afforded by the north-eastern climate, the percentage of mortality may be expected to range from 68·8 to 82 per cent.

PONTIS (R. E.). **El 'marchitamiento' del Pimiento (Capsicum annuum) en la provincia de Mendoza.** [The 'wilt' of Chilli (*Capsicum annuum*) in the province of Mendoza.]—*Rev. argent. Agron.*, vii, 2, pp. 113–127, 2 pl., 1 fig., 1940. [English summary.]

A detailed, tabulated account is given of an investigation, in progress since 1935 and still continuing, on chilli wilt in Mendoza, Argentine Republic. The disease is characterized by drooping, a pale chestnut-coloured discoloration and death of the foliage, dark chestnut, sunken lesions at the shoot bases, with shrivelling and blackening of the cortex, and darkening of the tap- and lateral roots, the cortical tissues of the former being disorganized. Infection occurs in a plantation in scattered groups, the extent of which gradually increases as the season advances: an attack in early spring prevents fruiting and involves the complete destruction of the crop.

From the diseased roots and shoots were isolated on 2 per cent. glucose and broad bean agar *Fusarium vasinfectum* [*R.A.M.*, xviii, p. 89], *F. solani*, and its var. *martii*, of which only the first-named gave positive results in soil inoculation experiments at 27° C. on seedlings raised from sterilized seed. The pathogen grew very slowly at 16°, but developed rapidly between 23° and 31°, with an optimum at 26° to 28°, the maximum for growth lying above 32°. The mean soil temperatures in December, January, February, and March for 1936 to 1939 were 20·8°, 27·6°, 24·7°, and 22·7°, corresponding to which infection became established in the plantations in January and reached a climax in February (in the north of the province). The highest percentage of wilt (58·5) from 1936 to 1938 occurred in soil with an average moisture content at a depth of 0·2 m. of 14·7 per cent., resulting from irrigation at four-day intervals, the incidence at 12 per cent. (16-day intervals) being only 20 per cent.

Satisfactory control of the disease was obtained in three years' experiments by the adoption of Garcia's furrow-ridge method, as applied to the similar disorder of chilli due to *F. annuum* in New Mexico [ibid., xiii, p. 420.]

BITANCOURT (A. A.). **As doenças da Cana de Açucar no Brasil.** [Sugar-Cane diseases in Brazil.]—*Biologico*, vi, 6, pp. 137–143, 1940.

This is a summary of the literature on sugar-cane diseases in Brazil, grouped under the headings of virus, root and stem, and foliar, accompanied by a table showing the reactions to mosaic of the different varieties grown in the country, and followed by a bibliography of 22 titles [*R.A.M.*, xviii, p. 624].

ZAMORA (J. C.). **El mosaico de la Caña de Azucar.** [Sugar-Cane mosaic.]—*Agricultor venez.*, iv, 45–46, pp. 15–18, 2 figs., 1940.

Mosaic being the most serious disease of sugar-cane in Venezuela [*R.A.M.*, xiv, p. 397], a semi-popular account is given of its symptomatology, etiology, economic importance, mode of transmission, and control, based largely on the investigations of M. T. Cook and F. S. Earle, with a view to assisting growers in the work of eradication.

HIRATSUKA (N.). **Japanese species of Gymnosporangium.**—*Bot. & Zool.*, vii, pp. 748–749, 1939. [Japanese. Abs. in *Jap. J. Bot.*, x, 4, p. (41), 1940.]

Eleven species of *Gymnosporangium* are enumerated for Japan [*R.A.M.*, xvi, p. 411]. An analytical key is given for their identification, and the synonymy, hosts, and distribution of each species cited.

GADD (C. H.). **'Bitten-off' disease of Tea seedlings.**—*Tea Quart.*, xiii, 2, pp. 54–58, 3 figs., 1940.

'Bitten-off' disease of tea [*R.A.M.*, xviii, p. 729] is one of the most destructive conditions affecting certain nurseries in Ceylon. The first symptom is the unthrifty appearance of the plants, the leaves being crowded together and the older ones falling prematurely. Later on, growth ceases, the leaves drop, and the bushes die. By the time the state of the tea has been noticed, the finer roots and most of the tap-root have disappeared. The transference to roots of healthy seedlings of fungi, including a species of *Rhizoctonia*, isolated from roots of affected tea, invariably failed to reproduce the disease.

To ascertain what part might be played by excess of water in conducing to bitten-off disease, tea seedlings were grown in pots in (1) a very wet, but not waterlogged soil, (2) a waterlogged soil, and (3) a wet, but not waterlogged soil. After three months the plants in lot (3) had made fair growth, while those in (1) and (2) were unthrifty and showed root decay, i.e., they exhibited symptoms of bitten-off disease. Field examination, however, demonstrated that excess of water was not the only cause of the condition.

Other experimental evidence clearly showed that tea does not tolerate a neutral or alkaline soil, and that such soils of themselves cause bitten-off disease. This conclusion was fully confirmed by numerous chemical analyses of soil samples, and explains why the disease is so often found in nurseries on old building sites, where mortar and lime rubble have become incorporated in the soil. The excessive use of wood ashes from domestic fires and from tea-driers is a frequent cause of deterioration in soils used for tea.

GADD (C. H.). **Report of the Mycologist for 1939.**—*Bull. Tea Res. Inst. Ceylon* 21, pp. 31–37, 1940.

In this report [cf. *R.A.M.*, xviii, p. 713] the author states that phloem necrosis of tea [ibid., xix, p. 120] has now been definitely identified from 103 estates in Ceylon, the distribution of which suggests that the disease occurs throughout the tea-growing districts at elevations above 4,000 ft.; it has been found in very few localities below this elevation. Between November, 1936, and July, 1938, 25 affected bushes from different estates were transplanted among healthy tea at St. Coombs, but the change of site did not lead to recovery, though none of the healthy bushes have so far developed any symptoms of necrosis. Three bushes before transplanting showed the disease in parts only, and no spread occurred subsequently in these. The experiment indicates that while a change of soil and climate does not assist recovery, the disease is not readily transmitted, and spread through a bush may be very slow.

Some young tea bushes were killed by *Leptothyrium theae* [ibid.,

xviii, p. 822], and one old bush was killed, after collar-pruning, by the same fungus.

Armillaria mellea was observed for the first time on *Tephrosia vogelii*, grown among tea, while the same host was also affected, on another estate, by *Ustulina* [*zonata*]; *T. vogelii* appears, therefore, to be susceptible to all the common root diseases of tea.

Very few reports of leaf fall of *Grevillea* [*robusta*] trees due to *Phyllosticta* [cf. ibid., xviii, p. 822] were received, but in the Uva district this host was affected by a die-back of the upper branches, developed after a period of drought.

Fifty-second Annual Report of the Kentucky Agricultural Experiment Station for the year 1939. Part I.—63 pp., [1940].

The following items of interest occur in this report [cf. *R.A.M.*, xviii, p. 576]. During 1939, wildfire [*Bacterium tabacum*: ibid., xix, p. 617] caused extensive damage in untreated beds in western Kentucky, often killing over 50 per cent. of the plants. Beds sprayed with Bordeaux mixture were in most cases unaffected. Of 279 untreated beds examined, 79 and 86 showed wildfire and angular leaf spot [*Bact. angulatum*], respectively, while of 207 treated beds 2 showed wildfire. Of 47 fields set from untreated beds the losses from these diseases at cutting time were as follows: 1 per cent. in 21 fields, 5 to 10 per cent. in 15, 15 to 20 per cent. in 8, 25 per cent. in 2, and 50 per cent. in one. No damage occurred from either disease in fields set from treated beds.

Black shank [*Phytophthora parasitica* var. *nicotianae*] appeared on four farms near Adairville and on an adjoining farm in Tennessee. The disease had been present on one of these farms in 1935, and had been carried to the others by drainage water; it destroyed over 32 per cent. of the plants on one farm, and half-an-acre of tobacco on another.

Mosaic caused greater damage to dark tobacco than wildfire and angular leaf spot. The burning type was present and destructive in many fields, and some fields were cut green because the growers confused the disease with wildfire. That the mosaic continues to be so destructive emphasizes the need for the development of resistant varieties. Strains of mosaic-resistant dark field tobacco from crosses with Ambalema grown in 1939 by two commercial growers showed high resistance in the field, coupled with a satisfactory type of growth. Twenty-nine strains of Burley tobacco derived by hybridization with mosaic-resistant Ambalema and back-crossing with Burley once or more on the F_2 resistant selections were tested in the field, each plant being inoculated four times with white and yellow mosaics. Of the strains tested 25 developed no sign of mosaic except chlorosis or necrosis at the inoculation sites. Some of the strains showed excellent growth type and quality. By continued back-crossing on the necrotic spotting progeny of a fertile *Nicotiana glutinosa* × *N. tabacum* hybrid (Ternovsky), strains of Burley tobacco were developed indistinguishable from the commercial type, except that they carry the necrotic spotting factor which generally localizes the virus in the inoculated leaves. A strain homozygous for the necrotic spotting factor was isolated which was rather more variable in plant characters than the original variety.

Fusarium wilt [*F. oxysporum* var. *nicotianae*: ibid., xvi, p. 658] is

becoming increasingly destructive to Burley tobacco in the sandy areas of Kentucky. Inoculation tests showed that one variety was resistant not only to this disease, but also to black root rot [*Thielaviopsis basicola*] and mosaic.

Blue mould (*Peronospora tabacina*) [ibid., xix, p. 619] occurred first on plants almost ready to set. The disease has caused so little damage during the past three years that the only control measure necessary will probably be to use new beds in unshaded places.

NAGHSKI (J.), HALEY (D. E.), & REID (J. J.). **Seed-bed sterilization and Tobacco wildfire.**—Abs. in *J. Bact.*, xl, 1, pp. 168–169, 1940.

Suspecting an increased prevalence of tobacco wildfire [*Bacterium tabacum*] in seed-beds sterilized with steam for the purpose of combating the organism in Pennsylvania [*R.A.M.*, xviii, p. 553], the writers examined samples of soil steamed (*a*) in the autumn and (*b*) in the spring previous to sowing and (*c*) untreated. Glucose-peptone-agar was used for fungal counts, nutrose agar for bacteria and Actinomycetes, and crystal violet-asparagin-mineral salts broth for the green-fluorescent bacteria [*Pseudomonas fluorescens*]. All the samples yielded every type of organism specified, *P. fluorescens* being most numerous in spring-steamed soils. Serological tests showed that 75 per cent. of the green-fluorescent organisms from steamed soils and 60 per cent. from the untreated were identical with known cultures of the agent of wildfire. It is obvious from these results that recommendations for steam sterilization of the soil as a means of controlling wildfire are misleading.

SMITH (K. M.). **The Tomato and the cigarette.**—*J. R. hort. Soc.*, lxv, 8, pp. 243–244, 1940.

As a result of inquiries into cases of virus diseases of tomato recently reported by growers to the Virus Research Station, Cambridge, it was found in every case that persons in charge of the tomato plants either smoked cigarettes or chewed tobacco while tending the plants. In one instance the virus causing a severe yellow mosaic of the tomato crop was isolated from a sample of the local cigarettes smoked by the gardener. It is pointed out that the virus of tobacco mosaic, which causes mosaic and stripe in tomato plants, remains infective in processed tobacco, and gardeners are therefore warned not to smoke while tending the plants and to wash their hands carefully with soap and hot water before starting work [cf. *R.A.M.*, vii, p. 124].

NELSON (R. M.). **Vigorous young Poplar trees can recover from injury by Nectria cankers.**—*J. For.*, xxxviii, 7, pp. 587–588, 1940.

Young yellow poplar [*Liriodendron tulipifera*] stands in the southern Appalachians are liable to infection by a species of *Nectria* [? *N. galligena*] responsible for the so-called 'target canker' [*R.A.M.*, xiv, p. 407], and in order to settle the question of the importance of the disease in relation to crop selection, a plot was established for study purposes in 1933 in the Bent Creek Experimental Forest, North Carolina, consisting of 15- to 20-year-old, 35 ft.-high trees, of which 60 were measured for canker diameter, length, and width, and bole circumference at the widest part of the canker, and classified as of poor, medium, or good

vigour, and of over-topped, intermediate, or codominant and dominant crown classes.

In 1938 the following data were obtained in respect of mortality and healing: of the 28 trees of poor vigour, 68 per cent. were dead and 7 per cent. healed, the corresponding percentages for trees of medium and good vigour being 8 and 68 and 0 and 86, respectively. Of the 21 trees in the over-topped crown class, 76 per cent. were dead and 7 per cent. recovered, the corresponding percentages for the intermediate being 19 and 25 and for the codominant and dominant 9 and 83, respectively.

A marked difference was observed in the growth rates of trees with healed and open cankers, the average basal increment of the former at the end of five years being 153 per cent. compared with only 42 per cent. for the latter. The average diameter increases of healed and unhealed trees were 1·32 and 0·34 in., respectively.

All the trees under observation bore at least one canker and 13 had from two to four cankers each, ranging from 0·7 to 23 by 0·6 to 3·8 in. The average amount of cankered circumference in 1933 was 33 per cent. for trees that lived and 48 per cent. for those that died.

It is apparent from these data that infected dominant or codominant trees of at least moderate vigour may be selected with reasonable safety as crop trees.

BUCHANAN (W. D.). **Scolytus sulcatus Lec. transmits Dutch Elm disease fungus under controlled conditions.**—*J. econ. Ent.*, xxxiii, 2, pp. 250–251, 1940.

Scolytus sulcatus occurs in parts of New York, Connecticut, and New Jersey, apple being probably its preferred host, though breeding takes place in elm, plum, peach, and mountain ash [*Pyrus* (?) *americana*]. The beetle has been found in elms attacked by *Ceratostomella ulmi*, and the fungus isolated from insects found in and issuing from elm material collected in the field. Under controlled conditions at the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, beetles artificially contaminated with *C. ulmi* inoculated elm and apple trees, the former also contracting infection when fed upon by insects issuing from diseased elm wood. These experimental results do not of course prove that *S. sulcatus* is actually concerned in the transmission of *C. ulmi* in nature, the extent of the insect's implication in the spread of the disease remaining purely conjectural pending further studies.

FELT (E. P.). **European Elm bark beetle and Dutch Elm disease control.** —*J. econ. Ent.*, xxxiii, 3, pp. 556–558, 1940.

A consideration, in the light of the past six years' experience, of the various aspects of the Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xix, p. 624] control problem in relation to the depredations of the elm bark beetle (*Scolytus multistriatus*) in the eastern United States has convinced the writer that the incidence of the insect is mainly local and that it is largely confined to diseased or dying wood. The normal limit of flight suggests that there would ordinarily be no extensive invasion from neighbouring territories. The immense production of beetles in

New Jersey in 1937, for instance, did not materially increase the number of infected trees in New York in 1938. The author considers that the data to hand, though admittedly inconclusive, indicate the possibility of local control by means of two to three relatively inexpensive midsummer prunings and the immediate burning of weak wood.

HARDY (M. B.), LUTZ (H.), & MERRILL (S.). **A preliminary report of Pecan leaf scorch studies.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 489–492, 1940.

In this preliminary report of studies on pecan leaf scorch the authors state that the condition is marked by the development of necrotic areas on the basal edges of the leaflets. These lesions do not enlarge much before the leaflet falls. The leaflets first affected are generally those at the base of the basal leaves. As the condition progresses the basal leaves fall and the trees may become almost completely defoliated. The disease may appear when the leaves reach full size or later, but it generally appears early rather than late. The Desirable, Moore, and Stuart varieties are much more seriously affected than most of the others commonly grown. Data are presented which indicate that an increase in the water supply or a decrease in the rate of water loss through transpiration reduces significantly the incidence of leaf scorch. Observations show that the condition is severe in years of low rainfall, and in soils with low water-holding capacity and fertility. The degree to which a variety or an individual tree is affected varies with the season, soil, cultural practice, and fruiting, and may be such as to cause complete loss of crop and extensive dying of the shoots.

JACKSON (L. W. R.). **Effects of H-ion and Al-ion concentrations on damping-off of conifers and certain causative fungi.**—*Phytopathology*, xxx, 7, pp. 563–573, 3 graphs, 1940.

Studies were conducted by the Division of Forest Pathology, Bureau of Plant Industry, in co-operation with the Allegheny Forest Experiment Station and the University of Pennsylvania, on the effect of the hydrogen- and aluminium-ion concentrations of the medium (a sodium glycerophosphate solution containing ferric citrate and other mineral compounds) on the damping-off disease of conifer seedlings and on the growth of the causal organisms (*Pythium*, including ? *P. ultimum*) and *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvii, p. 281].

The amount of growth produced by the *P.* isolates from *Pinus aristata*, Douglas fir [*Pseudotsuga taxifolia*], and sugar beet was nil at P_H 2·5 and 3·5, rose to a maximum at 5·5 and 6·5, and fell to zero again at 8·5 in all the series except one. In the absence of sugar chlamydospore and oospore production was less profuse at P_H 4·5 than at 6·5. The *C. solani* strains from red pine [*Pinus banksiana*] and Douglas fir failed to grow at P_H 2·5, developed slightly at 3·5, considerably more at 4·5 to 6·5, and fell off again at and beyond 7·5. Sclerotial production was nil at P_H 3·5 and 4·5, increased at 5·5 and 6·5, and fell to zero again at 7·5 and 8·5. The incidence of damping-off in *P. ponderosa* and Douglas fir in liquid cultures was lowest at P_H 2·5 and 3·5, reached a peak at 6·5, or less frequently at 5·5, and then decreased. In quartz sand cultures the relationship between the hydrogen-ion concentration

of the medium and damping-off was less consistent than in the liquid, except that there was a low incidence in all the series run at P_H 2·5.

Aluminium exerted a barely significant beneficial effect on damping-off in sand cultures at P_H 3·5 at a 0·0005 M. concentration of aluminium sulphate. Both with and without aluminium the damping-off percentages were higher at P_H 6·5 than at 3·5.

The hydrogen-ion concentration of P_H 2·5 was practically the lower limit for the host roots in both liquid and sand cultures; growth was excellent from 3·5 to 6·5, while a falling-off in development was also noticeable at 7·5 and 8·5. The maximum aluminium sulphate concentration of 0·0005 M. used was near the limit for the growth of the host roots.

EHRLICH (J.) & OPIE (R. S.). **Mycelial extent beyond blister rust cankers on Pinus monticola.**—*Phytopathology*, xxx, 7, pp. 611–620, 1 diag., 1940.

Microscopic measurements of the longitudinal extent of the mycelium of *Cronartium ribicola* beyond the outer limits of superficial discoloration in the bark of *Pinus monticola* [*R.A.M.*, xix, p. 314] were made on the distal ends of 116 cankers in green stems and branches and on the proximal ends of 146 in green stems and green and flagged branches collected in October, 1935, from three ecologically comparable areas in Idaho. The extent of mycelial progression beyond the externally discoloured area ranged from 0·5 to over 3 cm. (5·5 cm. in one canker), with a mean of 1·66 cm. The mean extents were found to be approximately 2·3, 1·5 to 1·6, and 1·2 cm. for cankers on green stems and green and flagged branches, respectively. Mycelial extent was found to be variously correlated with the estimated age of the canker, the stage of the canker, the thickness of the bark at the outer limits of surface discoloration, and the diameter of the cankered internode at the same region. Internode diameter was adjudged to be a useful criterion for the field appraisal of mycelial progress.

YOUNG (H. E.). **Fused needle disease and its relation to the nutrition of Pinus.**—*Qd agric. J.*, liii, 1, pp. 45–54; 2, pp. 156–177; 3, pp. 278–315; 4, pp. 374–392; 5, pp. 434–452, 35 figs., 1 diag., 8 graphs, 1940.

This paper contains the results of many years' extensive investigations of the needle fusion disease of pine in Queensland [*R.A.M.*, xviii, p. 502]. This condition is considered to be only one of a number of closely related abnormalities and a limiting factor in the establishment of exotic pines in certain localities. Experiments showed that soil is the only factor directly bearing on the condition, while genetic factors are thought to act in a secondary manner. Minor elements and the physical nature of the soil are dismissed as primary causes, but the action of phosphorus in relation to pine nutrition is considered to be of major importance. The organic matter complex was found to be fundamentally related to the occurrence of the disease. In a number of field experiments, fused needle and related abnormalities were successfully controlled by the use of phosphatic manures, which are believed to increase the litter due to the stimulation of natural vegetation, stimulate the growth of fungi, thereby increasing the production of organic matter,

assist the phosphatide excretion of the roots, which results in better mycorrhizal development, and aid directly the nutrition of the pine tree. The last-named is thought to be unimportant. It is suggested that fused needle and related manifestations of malnutrition are intimately connected with the mycorrhizal complex. The deficiency of raw organic matter following the clearing and burning of the natural forest results in an unhealthy mycorrhizal condition and is directly responsible for the malnutrition of the tree. The phosphate dressings bring about a return to healthy mycorrhizal development; before treatment the fungi tend to become actively parasitic, but afterwards they become non-parasitic and are digested by the root cells. A carbohydrate hypothesis for the physiologic role of tree mycorrhiza is advanced, according to which normal mycorrhiza supply the tree with an essential part of their carbohydrate requirement, and fused needle is believed to be due to the inefficient functioning of the mycorrhiza in this respect. The application of additional phosphorus to soils low in this element leads to a more abundant phosphatide excretion from the pine roots, establishing a satisfactory balance of conditions for correct mycotrophic activity. Soil analyses have shown that the minimum total phosphate content required by *Pinus taeda* is 135 p.p.m. and for *P. caribaea* 110 p.p.m. The condition may be economically remedied by a broadcast dressing of calcium superphosphate.

In dry areas with fertile soils, fused needle appears to be due to moisture deficiency, resulting in inadequate litter formation suitable for mycorrhizal activity.

SMITH (C. O.). **Galls on Pseudotsuga macrocarpa induced by Bacterium pseudotsugae.**—*Phytopathology*, xxx, 7, p. 624, 1 fig., 1940.

Inoculation tests with *Bacterium pseudotsugae* from Douglas fir (*Pseudotsuga taxifolia*) on *P. macrocarpa* at the California Citrus Experiment Station produced galls resembling those described by Hansen and R. E. Smith on the original host [*R.A.M.*, xvi, p. 718]. Similar results were obtained on *P. taxifolia* var. *glauca*, but *Abies concolor* reacted negatively to infection.

MILBRATH (J. A.). **Coryneum blight of oriental Arborvitae caused by Coryneum berckmanii n. sp.**—*Phytopathology*, xxx, 7, pp. 592–602, 3 figs., 1940.

Latin and English diagnoses are given of *Coryneum berckmanii* n. sp., the agent of a destructive blight of oriental arbor vitae (*Thuja orientalis* var. *conspicua*) in Oregon, the symptoms induced by which include a reddish-brown discoloration and shedding of the small branches, girdling of the ends of the infected areas of larger twigs, and the development of a pale grey cast over the foliage. Infection is spread to the new growth by means of spores, with progressive devitalization and ultimate death of the tree. The young scale leaves of the terminal branchlets constitute the foci of primary infection, which is facilitated by small wounds, though uninjured tissues may be penetrated. The woody stems at the base of infected twigs are not girdled, but small, inactive cankers develop on them. Sporulation is confined to the scale leaves or the small stems enclosed therein.

Besides *T. orientalis* var. *conspicua*, the varieties *beverleyensis*, *elegantissima*, *compacta*, and *stricta* and *Cupressus sempervirens* var. *stricta* are subject to natural infection (the last-named only occasionally). When 50 *T. orientalis* plants were interspersed in an infected stand, 39 became blighted during the first two years.

The causal organism is characterized by black, erumpent, pulvinate acervuli, 246 μ in diameter, and oblong to fusoid, 5-septate conidia, 24·8 to 36·5 by 8·6 to 11·5 (average 28·8 by 9·9) μ, with the four median cells olive-brown and the two terminal hyaline, furnished with pedicels 13·3 to 25·1 (23·3 by 2·3) μ, and borne on profusely branched, septate, hyaline conidiophores, 26·6 to 53·2 by 2 to 2·6 (42·6 by 2·3) μ, without paraphyses. The only other 5-septate species of *Coryneum* known to be pathogenic is *C. cardinale*, a parasite of *Cupressus macrocarpa* in California [*R.A.M.*, xix, p. 623], from which *Coryneum berckmanii* differs in its non-loculate stroma, type of acervulus, smaller spores, and cultural characters. *C. cardinale*, moreover, attacks mature woody stems, while *C. berckmanii* is confined to the foliage and young stems. The latter species grows rapidly at room temperature on potato dextrose agar until a diameter of 20 mm. is reached, after which the rate of development declines and ceases at a diameter of 35 to 40 mm.; at 50° to 65° F. almost twice as much growth is made as at 75° to 80° and continues until the plate is covered. The colonies are pale to salmon-pink in the centre, fading to white at the edge, sometimes zonate. The fungus develops similarly on maize meal, bean pod, and Lima bean agars, but growth on prune agar is very sparse, the mycelium being entirely submerged and the colonies olive-brown. On agar media spores are produced only in cultures several months old exposed to temperatures below 65°, but profuse sporulation, in the form of pustules 1 to 2 mm. in diameter, occurred in a few weeks on wet, autoclaved oat grains.

The artificial inoculation of *T. orientalis* with *C. berckmanii* presents considerable difficulties, the best results being secured by the introduction of fragments of mycelium or spore masses under the imbricated leaves near the branchlet tips, which induced a condition indistinguishable from natural infection, especially in plants exposed to the cold autumn rains shortly after inoculation. In the north-west, primary infections are initiated in October, and by November foci 1 to 2 mm. in diameter develop and produce spores, which are splashed on to the healthy foliage and give rise to secondary infections, this process persisting until February or March. With the onset of warmer and drier conditions, the spread of the fungus ceases, but many of the small girdled branches turn brown and die.

Satisfactory control of the blight may be effected by one application of red copper oxide (3 in 100) or basic copper sulphate (2 in 50) before the establishment of initial infection in the early autumn.

VOGEL (F. H.). **Some notes on the preparation of Cyathus stercoreus as a test organism for the rapid determination of decay resistance in treated timbers.**—*Pap. Mich. Acad. Sci.*, xxv, pp. 179–185, 1940.

The author recommends the use of *Cyathus stercoreus*, the most common bird's nest fungus in the Lake States, as a test organism for the

rapid determination of decay resistance in treated timbers. The fungus is grown in pure culture on malt agar (1 to 2·5 per cent. Trommer's liquid malt, and 1 to 2·5 per cent. bacto-agar) and as soon as the mycelial mat completely covers the agar, sterilized wood test strips are laid flat on the fungus and allowed to remain for the duration of the test. The sterilization technique of Schmitz, von Schrenk, and Kammerer [*R.A.M.*, xviii, p. 4], by which the wood is dipped intermittently in boiling water, was adopted, the moisture in the wood expediting attack and preventing early drying out of the cultures. At the conclusion of the experiment the test blocks are examined and the condition of the wood noted before determination of final oven-dry weight.

By using *C. stercoreus* it was possible in one week to arrange 22 American woods in an order corresponding almost exactly with relative durability ratings published after long research.

Baxter (D. V.). **Some resupinate Polypores from the region of the Great Lakes. XI.**—*Pap. Mich. Acad. Sci.*, xxv, pp. 145–170, 12 pl., 1940.

This is a critically annotated list of 10 resupinate Polypores from the Great Lakes region of the United States, Alaska, the Yukon, the Northwest Territories, and Canada [cf. *R.A.M.*, xix, p. 309], including one new species.

Dealing with *Poria incrassata*, the author states that this fungus, reported from Ontario, the District of Columbia, and 20 of the United States, does not occur in forests, appearing only in buildings and stacked timber. It attacks every commercial species of wood, and is particularly prevalent in the south and north-west in buildings where there is heavy condensation of moisture in walls and between floors and sub-floors, though it is also frequently found in buildings in which moisture is not excessive [ibid., iii, p. 563]. Lumber shipments appear often to be responsible for the appearance of this fungus in other districts. It frequently spreads in the joists and baseboards and passes up into door and window frames. In some cases it has destroyed the timber in a second story and progressed to the third. The author observed it running up concrete posts and passing through wooden flooring more than 4 ft. from the ground into piles of kiln-dried lumber stacked in dry sheds, and several thousand feet of this lumber had to be re-sawn to save what was still saleable. The evidence indicates that in the south, at least, the association between *P. incrassata* and termites is less close than has been believed.

Richards (C. Audrey) & Chidester (Mae S.). **The effect of Peniophora gigantea and Schizophyllum commune on strength of Southern Yellow-Pine sapwood.**—*Proc. Amer. Wood Pres. Ass.*, xxxvi, pp. 24–31, 3 figs., 1 diag., 2 graphs, 1940.

Logs of freshly felled loblolly and slash pines (*Pinus taeda* and *P. caribaea*) were quarter-sawn into $1\frac{1}{4}$ by $1\frac{1}{4}$ by 15 in. specimens and three-fifths of the number inoculated, after 20 minutes' steaming at atmospheric pressure, with pure malt agar cultures of *Peniophora gigantea* [*R.A.M.*, xviii, p. 361], *Schizophyllum commune* [ibid., xix, p. 175], or *Lenzites sepiaria*, the remainder being left as controls. After

four months in the laboratory, *L. sepiaria* had produced a brown, crumbly rot in localized areas of the wood, and at the end of six months the inoculated pieces were too badly decayed for further testing. *P. gigantea*, though less detrimental to the strength properties of *Pinus taeda* than *L. sepiaria*, did cause a substantial decrease. In four months, fibre stress at proportional limit, modulus of rupture, work to proportional limit, and work to maximum load were reduced by over 50 per cent. in both *P. taeda* and *P. caribaea* by *L. sepiaria*, whereas the maximum average reduction caused by *Peniophora gigantea* was 35 per cent. in work to maximum load in the *Pinus caribaea* specimens infected for six months, the corresponding figure for *P. taeda* being 20 per cent. *S. commune* gave less uniform results than the other two fungi, but for the most part caused little or no decrease in the strength of the test pieces except in work to the proportional limit.

Boller (E. R.). **Zinc chloride-petroleum treatment for ties.**—*Proc. Amer. Wood Pres. Ass.*, xxxvi, pp. 361–376, 6 figs., 1940.

A tabulated account is given of experiments in the zinc chloride-petroleum method of railway sleeper preservation, using five kinds of wood, viz., red and white oaks [principally *Quercus borealis* and *Q. alba*], western yellow and lodgepole pines [*Pinus ponderosa* and *P. contorta*], and Douglas fir [*Pseudotsuga taxifolia*], from which it appears that the best results are secured by a successive two-movement process involving (in laboratory tests) initial air pressure (60 lb. for 30 mins.) or vacuum (27 in.), a zinc chloride pressure period of 3½ to 5 hours at a maximum temperature of 180° to 240° F. and maximum pressure of 125 to 200 lb., an oil pressure period of 3 to 6 hours at a maximum temperature of 180° to 250° and maximum pressure of 125 to 200 lb., an intermediate vacuum of 1 to 1½ hours at a maximum of 27 in., an oil pressure period of 2½ to 5 hours at a maximum temperature of 210° to 250° and maximum pressure of 125 to 200 lb., and a final vacuum of 0 to 5 minutes. The retention of zinc chloride and oil ranged from 0·40 to 0·79 and 2·59 to 14 lb. per cu. ft., respectively. The two substances penetrated from 60 to 100 per cent. of the wood in the red oak tests and all the sap wood and ⅛ heartwood in the white oak tests; zinc chloride penetrated 60 to 90 per cent. of the wood in the *Pinus ponderosa* series and oil 25 to 90 per cent., the depth of penetration of the two substances in the Douglas fir tests being 1 to 2 in. and $\frac{1}{16}$ to 1¼ in., respectively. All the sap wood and half the heartwood were penetrated both by the chloride and oil in tests on *P. contorta*.

In an experiment on a semi-commercial scale in a cylinder 18 by 4 ft. belonging to the Indiana Wood Preserving Company, using partially or thoroughly seasoned red oak, about three hours' immersion in 5·5 per cent. zinc chloride (empty-cell process) was necessary to secure complete impregnation of the dry wood, and five hours' vacuum for an average retention of 8 lb. oil per cu. ft. In the case of the green wood a period of five hours was requisite both for the chemical and oil treatments.

A few preliminary tests were carried out with a zinc chloride-tar (2 parts gas-house and 1 part coal) mixture on southern yellow pine [*P.* spp.], using a successive two-step procedure similar to that already

described, with very satisfactory results. A fairly high temperature (240°) was necessary to obtain good penetration of the particular blend of highly viscous tar employed in these trials.

DEARBORN (C. H.). **Magnesium deficiency in Cauliflower in Delaware County, New York.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 773–777, 1 fig., 1940.

In 1937, a chlorosis of cauliflowers was general in Delaware County, New York, causing severe losses in several areas. The first symptom is a yellow interveinal mottling on the lower leaves, rather uniformly distributed over the whole leaf. Young leaves are rarely affected. In wet seasons, the chlorotic parts fall out, while in dry weather they become dry and tan-coloured. When the affected leaves remain intact they become stiff and bronze-coloured, but retain their shape. The condition generally results in abscission of the lower leaves and conspicuous reduction in the size of the head. The results of field experiments indicated that the condition may be avoided by an application to the soil of magnesium oxide at the rate of not less than 300 lb. per acre. Even where symptoms were not apparent, significant increases in the number and weight of saleable heads resulted from the use of dolomitic hydrated lime. A greenhouse experiment also showed that the addition of magnesium sulphate to the field soil in pots induced a marked increase in the average weight per plant. From the results of these studies it is concluded that the condition is due to magnesium deficiency.

REINKING (O. A.) & GLOYER (W. O.). **Yellows-resistant varieties of Cabbage suitable for New York State.**—*Bull. N.Y. St. agric. Exp. Sta.* 689, 28 pp., 3 figs., 1 map, 1940.

Particular importance attaches to the development of cabbage varieties resistant to yellows (*Fusarium conglutinans*) in New York, the leading State of the Union in the production of this crop, which cannot at present be grown at all in many of the areas suffering severely from the disease. As a result of replicated experimental plantings in 1937, 1938, and 1939, it was found that any of the following mid-season or 'kraut' varieties may be recommended for cultivation in infested fields: Racine Market, Early Copenhagen Resistant, Marion Market, Glory Yellows Resistant, Globe, All Head Select, and Wisconsin All Season [*R.A.M.*, xvii, p. 218], all with resistance ratings of 95 to 100 per cent. except the last-named (90 to 100). Among early varieties, Jersey Queen is highly resistant (98 to 100 per cent.) but unprolific, while Detroit Resistant and Resistant Golden Acre (80) need further selection. None of the late (Danish) varieties entirely meets the requirements of the New York market, but Wisconsin Ballhead (97 to 100 per cent. resistance) should prove useful for immediate consumption, while the highly resistant Wisconsin Hollander types are more suitable for storage.

YOUNG (H. C.). **Dusting or spraying for the control of the blight of Sugar Beets.**—*Sug. Beet J.*, v, 5, pp. 87, 89, 92, 1940. [Abs. in *Facts ab. Sug.*, xxxv, 8, p. 36, 1940.]

Sugar beet blight (*Cercospora*) [*beticola*] is stated to be now causing

heavy annual losses in Ohio instead of, as formerly, in only one season out of five or seven [*R.A.M.*, xix, p. 1]. The results of spraying and dusting experiments in 1938 and 1939 clearly demonstrated the profitability of control measures, which increased the tonnage by 20 to 50 per cent. In both years the disease was serious, the untreated plots showing about 90 per cent. dead leaf area on 1st September. In general, dusting gave slightly higher yields than spraying, while the latter was somewhat more effective in the elimination of the pathogen. Copper-lime dust (20 : 80) was the best of the compounds tested, coverage and adhesiveness being improved by the admixture of 15 lb. flour and a reduction of the lime content to 65 lb. Applications should be made at ten-day intervals, early planted beets being given four treatments. The critical period for infection appears to be reached about six weeks after blocking and thinning. The total cost of dusting (three applications), using either the above-mentioned formula or fixed copper-lime (12 lb. tribasic, 73 lb. talc, and 15 lb. flour), is under $5, reckoning $33\frac{1}{3}$ lb. dust per acre per treatment. In most of the eastern beet-growing areas the yield and sugar reductions due to blight are from 2 to 5 tons per acre and 1 to $1\frac{1}{2}$ per cent., respectively, and the average net increase from dusting amounts to $25 per acre.

Service and regulatory announcements January–March, 1940. Announcements relating to Coffee quarantine (No. 73). Announcements relating to fruit and vegetable quarantine (No. 56). Present status of this (B.E.P.Q.) series. Plant quarantine import restrictions, United Kingdom of Great Britain and Union of South Africa. —*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 142, pp. 3–4, 4–7, 15–23, 23–36, 1940.

As from 1st April, 1940, no unroasted seeds or beans of coffee, coffee berries or fruits, or coffee plants and leaves may be imported into Puerto Rico (unless by the Department of Agriculture for scientific and experimental purposes or under special exemption permits) as a precautionary measure against the introduction of rust (*Hemileia vastatrix*).

By Amendment No. 1 to Quarantine No. 56, effective as from 27th February, 1940, Newfoundland is placed on the same basis as Canada with respect to the importation of fruits and vegetables into the United States, except as regards potatoes, which will continue to be excluded on account of wart disease [*Synchytrium endobioticum*].

A list is given of the circulars relating to Federal plant quarantines issued since 18th January, 1915, accompanied by explanatory remarks concerning their validity or otherwise at the present time.

A summary is given of the plant quarantine restrictions in force in the United Kingdom as revised to 6th February, 1940. By proclamation No. 555, effective from 1st February, 1940, the Governor-General of the Union of South Africa has amended Proclamation No. 286 of 1936 [*R.A.M.*, xvi, p. 640] by the introduction of a clause requiring the accompaniment of consignments of imported potatoes by a certificate of freedom from virus diseases issued by the Department of Agriculture of the country of origin.

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW OF APPLIED MYCOLOGY

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JOHNSON (R. A.). **Preservation of wooden poles.**—*Elect. Engr Merch.*, xvii, 1, pp. 17–18, 2 figs., 1940.

The 'sand-creosote collar' method for the preservative treatment of wooden poles at the ground-line, developed and adopted by the Hydro-Electric Power Commission of Ontario and fully described in *Elect. Engr Merch.*, xvi, pp. 219–221, 4 figs., 1939, is stated to be also giving excellent results at Glebe Island, Sydney, New South Wales, where impregnated poles of the Maritime Services Board are still in a sound condition after five years' service. A two-piece galvanized iron cylinder fastened with slides, allowing an annular cavity of about 1 in. all round the pole and extending 12 in. below the ground and 6 in. above it, is filled with creosote-saturated sawdust, re-treatment with ½ gal. of the preservative being necessary every two years. After back-filling with impregnated sawdust, the top is finished off with a tar compound, through which are inserted the re-treatment filler caps.

KNOTT (J. E.). **The response of Onions to manganese on unproductive peat soils.**—*Proc. Amer. Soc. hort. Sci.*, xxxvii, pp. 803–806, 1 fig., 1940.

Onions growing on unproductive peat soils in New York State show a yellowish cast of the leaves, a dying-off at the tips, and dwarfing. The condition was rectified by applications of manganese sulphate at the rate of 100 lb. per acre; without manganese the plants gradually died so that at harvest there were many missing plants in the rows. The cost of the treatment is much less than that of the ton or more of sulphur necessary to bring about a comparable improvement. Treatment can be delayed until the limits of the unproductive area are apparent. When the soil is dry the manganese sulphate should be applied in solution.

LEWIS (R. W.). **A method of inducing spore production by Cercospora apii Fries in pure culture.**—*Phytopathology*, xxx, 7, p. 623, 1940.

The following method was devised by the writer for the inducement of conidial production in *Cercospora apii* [cf. *R.A.M.*, xiv, p. 195; xix, p. 228] at the Michigan State College. Celery leaflets were placed in contact with sterilized slightly moistened soil (muck, compost, or sand), 2 cm. deep, in an Erlenmeyer flask, the whole sterilized by 20 minutes' autoclaving, and the leaflets used as a substratum for the mycelium of the fungus, which produced typical conidia in six days. The conidiophores, however, were abnormal, the distances between the geniculations amounting to hundreds of microns as compared with 10 to 30 μ

in field specimens. Old cultures (three years in one case) were equally prolific with new isolations in respect of conidial formation by this technique but cultures that had lost their characteristic colour yielded no spores.

WORMALD (H.) & HARRIS (R. V.). **Notes on plant diseases in 1939.**—*Rep. E. Malling Res. Sta., 1939*, pp. 58–62, 1940.

These notes [cf. *R.A.M.*, xviii, p. 654] contain the following items of interest. Injury, in some cases fatal, to young apple trees, associated with waterlogged conditions of the soil, and known locally as 'the death' [ibid., xvi, p. 540], was reported from a number of localities. Orchards subject to waterlogging should be well drained, and young trees securely staked to prevent excessive movement of the stem in strong winds. Raspberries growing on a very unsuitable soil were also affected by the same condition.

Williams' pear and Benn's Red apple trees from Suffolk and pear shoots from Kent showed 'papery bark' [loc. cit.], a condition probably induced by a sudden upward flow of sap.

The circular spotting of apple leaves known as 'Cox spot' because of its prevalence on Cox's Orange Pippin apples was very severe in some plantations; it is attributed to drought. A spotting of Czar plums, 'Czar spot', is considered to be probably due to the same cause; the lesions somewhat resemble those caused by bacterial attack, but are generally larger, and have a pale halo. Experimental evidence showed that 'dwarf lateral scorch' of raspberries [ibid., xvii, p. 688] and die-back of loganberries result mainly from imperfect breaking of the winter rest period owing to insufficient exposure to cold in winter.

A reddish discoloration distributed marginally or, more usually, as scattered spots on the leaves of Royal Sovereign strawberries and somewhat resembling severe crinkle was ascertained to be due to soil and weather conditions unfavourable to the normal development of new root fibre.

Stereum purpureum was found fructifying on posts in a garden and on a walnut tree cut back to induce shoot production.

Cox's Orange Pippin apples received towards the end of December showed circular, sunken areas $\frac{1}{5}$ to 1 in. in diameter, some bearing *Gloeosporium album*, others *Trichothecium roseum*, and all containing in the centre a lesion due to scab [*Venturia inaequalis*], the first two fungi clearly having effected entry through the injuries caused by scab.

Early in September, many leaves on a plot of Wellington's XXX black currants bore large discoloured patches due to *Botrytis cinerea*. Most were found near the margins, and many affected the terminal lobe, suggesting that infection had begun at the apical tooth, where water would tend to accumulate and favour attack.

Exceptionally severe infection by *Leptosphaeria coniothyrium* in 1938 caused widespread death in 1939 of fruiting raspberry canes in trial plots, the varieties mainly affected being Newburgh, Preussen, Viking, and Red Cross.

Blossom blight of sweet cherries (accompanied by infection of the leaves, fruit, and fruit stalks) was associated with an organism probably identical with *Pseudomonas mors-prunorum* [ibid., xviii, p. 689].

Hop downy mildew [*Pseudoperonospora humuli*: ibid., xviii, p. 818] did not cause much trouble, partly owing to dry weather in early summer and partly because routine spraying is now widely practised. Nettlehead [ibid., xix, p. 364] was widespread and very destructive.

WITTE (H.). **Redogörelse för verksamheten vid Statens centrala frökontrollanstalt under tiden 1/7 1938–30/6 1939.** [Report of the work of the State Central Seed Testing Station for the period from 1st July, 1938, to 30th June, 1939.]—*Medd. Frökontrollanst. Stockh.*, *1940*, 15, pp. 3–62, 1940.

The following items of phytopathological interest occur in this report. Ergot [*Claviceps purpurea*] was detected in 53 and 24 per cent., respectively, of the rye and six-rowed barley samples submitted for inspection. Sclerotia [? of *Sclerotinia trifoliorum*: *R.A.M.*, xviii, pp. 299, 684] were present in 23 per cent. of the Swedish red clover [*Trifolium pratense*] samples examined, in 20 lots of foreign red clover, in 12 of alsike [*T. hybridum*], in 5 of white clover [*T. repens*], and in 3 of hop lucerne [*Medicago lupulina*]. *Ustilago bromivora* was found in 16 out of 91 samples of brome grass [ibid., xvii, p. 505]. Of the 8,817 cereal seed-grain samples analysed for *Fusarium* contamination, the 676 subjected to seed treatment were to all intents and purposes clean: among the remainder very severe, severe, less severe, mild, and very mild infection occurred in 0·4, 3·7, 7·3, 21·2, and 46·5 per cent., respectively. Garden peas were extensively infected by *Ascochyta pisi*, beans [*Phaseolus vulgaris*] by *Gloeosporium* [*Colletotrichum*] *lindemuthianum*, and beets by *Phoma betae*.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 8, pp. 439–442, 4 figs., 1940.

In August, 1939, glasshouse tomatoes in New South Wales were widely affected by streak [cf. *R.A.M.*, xix, p. 372], first recorded locally in 1933 [ibid., xiv, p. 348]. The disease is most pronounced in winter, and the lower sets of fruit may be so badly disfigured when picked in September that their market value is negligible. The affected leaves bear irregular, often angular, dead areas, and longitudinal brownish streaks are frequently present on the midrib and veins on the under surface. Narrow, sunken streaks are found on the stems, while the fruits show irregularly shaped, angular, brownish spots of widely different dimensions, generally sunken, and usually scattered over the whole surface. [These symptoms agree with those of single virus streak: ibid., xvi, p. 348.] In the glasshouse spread occurs rapidly, especially during pruning, the virus being readily transmitted by workers' hands. Outdoor crops are seldom attacked. The tomatoes should be frequently inspected during winter, and all affected plants removed and destroyed. The hands should be washed before handling healthy plants. Seed for planting should be taken only from healthy vines.

As was expected on chemical grounds, shirlan AG, being stable in solution, has proved compatible with Bordeaux mixture, nicotine sulphate, lead arsenate, and colloidal sulphur in tests by various growers. After shirlan AG has been diluted for spraying it can safely be kept for some time before use.

A note is given on the control of tuber-borne potato scab [*Actinomyces scabies*] and *Rhizoctonia* [*Corticium solani*] by dipping in mercuric chloride, 1 in 1,000 plus 2 pints of hydrochloric acid per 25 gals. This solution may safely be used for 15 treatments of 10 minutes each. If the period of immersion is then increased to 15 minutes the solution will remain effective for a further five dippings, after which it should be discarded. Dipping may be effected some months before planting, and should be carried out before the tubers begin to sprout, and before cutting. Treated potatoes should be promptly dried.

DEIGHTON (F. C.). **Mycological work.**—*Rep. Dep. Agric. S. Leone, 1938*, pp. 64–66, 1939. [Received October, 1940.]

The following are among the items of interest in this report [cf. *R.A.M.*, xviii, p. 156]. During 1938 the incidence of citrus scab (*Sphaceloma fawcettii*) [*Elsinoe fawcetti*] was again very low, severely and lightly affected trees being dealt with by burning and pruning, respectively. Another record of pink disease (*Corticium salmonicolor*) on grapefruit was received from Port Loko, while the same fungus, in association with *Hypomyces haematococcus*, was observed on this host at Jaiama.

The uredo stage of *Uromyces appendiculatus* was found on French beans (*Phaseolus vulgaris*) at Yengema, this being the first record for the Colony, another new record for which is *E. canavaliae* on *Canavalia ensiformis* [ibid., xiii, p. 345] in the same locality.

An Asterinaceous fungus mentioned in the 1936 report as pathogenic to pineapples in two localities has been identified as *Asterinella stuhlmanni* [ibid., xvii, p. 161].

Other diseases include a rot of soursop [*Annona muricata*] probably caused by *Colletotrichum anonicola*, and leaf spots of *Crotalaria juncea* (*Cercospora demetriana*), *Hibiscus sabdariffa* (*C. hibisci*), tomato (*C. nicotianae*), and *Petunia* (*C. physalidicola*), all previously reported as *C. canescens* [cf. ibid., xv, p. 344], *C. brassicicola* on Chinese cabbage, *C. stizolobii* on *Stizolobium niveum* [*Mucuna nivea*], and *C. subsessilis* on *Melia azedarach*. The fungus previously reported as a *Piricularia* on *Solanum* spp. has now been identified as *Eriomycopsis tenuis*, a parasite of a common *Schiffnerula* on *Solanum*.

NANCE (NELLIE W.). **Diseases of plants in the United States in 1938.**—*Plant Dis. Reptr, Suppl.* 119, 289 pp., 12 graphs, 8 maps, 1940. [Mimeographed.]

The present survey of the diseases affecting cereal, fodder, fruit and nut, industrial, tree, ornamental, and miscellaneous crops in the United States in 1938 closely follows the lines of previous summaries covering the same ground [*R.A.M.*, xix, p. 7], the value of which is pointed out in an introductory note to be largely cumulative, a comparison of the conditions prevailing in different years being of much interest and importance.

MILBRATH (D. G.). **Bureau of Plant Pathology.**—ex *Rep. Calif. Dep. Agric., 1939* (*Bull. Dep. Agric. Calif.*, xxviii, 10), pp. 567–577, 1940.

In this report [cf. *R.A.M.*, xvii, p. 797] it is stated that, as a result

of the enforcement of celery-free periods in the Venice District and an area comprising approximately the western half of Ventura County, California, western celery mosaic [ibid., xviii, p. 369] has been so far brought under control that in 1939 the average yield per acre, locally, over an area of 1,200 acres amounted to 1,100 crates per acre, as against 311 crates in 1934. In some instances yields of 1,600 and 1,800 crates per acre were obtained, and the total value of the crop exceeded $1,000,000, in spite of very low market prices. The disease was also reported from the Sacramento–San Joaquin Delta in 1939, and a celery-free period was accordingly proclaimed from 6th until 23rd February, with the result that the yield averaged 220 crates per acre, as against 110 in 1938.

Bacterial ring rot [*Bacterium sepedonicum*: see below, p. 725] is present in about 95 per cent. of the Californian potato-growing areas, including Siskiyou, San Joaquin, Inyo, Madera, Tulare, Kern, San Benito, Santa Barbara, and Riverside Counties. The absence of the disease along the northern coast from Two Rock, Sonoma County, to the Oregon boundary, is due to the fact that in this area the crop has for many years been produced from locally grown seed. Laboratory examination of samples from incoming lots at Bakersfield during a period of three months showed 14 per cent. of all the lots examined to be affected.

In 1939, 8,372 peach trees were found to be affected with mosaic [ibid., xix, p. 227] in California compared with 17,847 in 1938, and 34,000 in 1937. Between 1936 and 1939, inclusive, 89,355 mosaic trees were found, and 63,651, or 71 per cent., removed.

Deglet Noor date palms developed decline due to *Omphalia* root rot [*O. pigmentata* and *O. tralucida*: ibid., xix, p. 590]; at present the most suitable method of control would appear to consist in the isolation of healthy individual palms and the certification of their offshoots.

Federal surveys of sugar pine [*Pinus lambertiana*] and *Ribes* stands disclosed no new centres of infection by white pine blister rust [*Cronartium ribicola*: ibid., xviii, p. 562]. Infected pines have been located in three places in California, the range of infection extending about 14 miles south of the Oregon border. That no appreciable spread occurred in 1939 is attributed to a reversal in the direction of the usual air currents; it is regarded as only a temporary phase in the situation.

Grapes were affected by a condition referred to as Pierce's disease, resembling that prominent from 1880 to 1900 and then known as California vine disease; numerous foci of infection appear to exist. One vineyard of 1,690 Emperor vines was rogued extensively from 1936 to 1939; in the former year it contained 1,279 healthy and 390 affected vines, while in the latter the corresponding figures were 1,648 and 22.

Laboratory investigations demonstrated that crown gall [*Bact. tumefaciens*] does not occur naturally in soil, and virgin soil may be considered to be free from it. It accumulates rapidly, however, in soil, and survives for at least two years.

Cherry crinkle [ibid., viii, p. 550] has increased in recent years as a result of the selection of budwood from affected orchard trees. By a discriminating selection from clean parent trees the disease could be largely avoided in nursery stock.

HARRIS (H. A.). **Comparative wilt induction by Erwinia tracheiphila and Phytomonas stewarti.**—*Phytopathology*, xxx, 8, pp. 625–638, 2 graphs, 1940.

In studies on the wilts of cucumber (*Erwinia tracheiphila*) and maize (*Phytomonas* [*Aplanobacter*] *stewarti*) at the University of Illinois, a decrease in the transpiration losses of plants affected by both diseases was observed during the initial stages of infection. Fluometric determinations by the method of Melhus *et al.* [*R.A.M.*, iv, p. 234] showed that the reductions in the flow of water through the stems amounted to 82 per cent. in the case of the former disease, and to 74 per cent. in that of the latter. The filtrates of both organisms from beef extract broth solutions induced wilting of cucumber and maize cuttings and the wilting was equally rapid with autoclaved filtrates. A mechanical plugging of the water-conducting system appears, from the transpiration and fluometric data obtained in these experiments, to be the primary cause of the bacterial wilts of cucumber and maize.

JOHNSON (T.) & NEWTON (MARGARET). **The influence of light and certain other environmental factors on the mature-plant resistance of Hope Wheat to stem rust.**—*Canad. J. Res.*, Sect. C, xviii, 8, pp. 357–371, 1 fig., 1 diag., 1940.

In greenhouse experiments at Winnipeg, carried out during 1936 and 1937, the relative influence of environmental factors on the mature-plant resistance [*R.A.M.*, xix, p. 585] of the wheat variety Hope to race 21 of *Puccinia graminis tritici* was studied. A comparison of plants grown in ordinary daylight with those shaded by a covering of two-ply cheesecloth inducing 60 per cent. reduction in light intensity, showed in the latter a slight tendency towards increased susceptibility. The shaded plants were softer, less rigid, and had a higher moisture content than the unshaded. Plants receiving six hours of light daily were found to be more susceptible than those given ten hours, the least susceptible being those grown in full daylight for the period of the experiment (February to June). The mature-plant resistance broke down in plants grown and kept after inoculation at constant high temperatures (75° to 80° F.), developing infections averaging, in numerical values according to the scale of 0 to 24 devised by Goulden *et al.* [ibid., x, p. 170] 16·5 on the leaves and 15·8 on the stems, whereas plants kept at ordinary greenhouse temperatures (55° to 80° daily) developed infections averaging only 5·4 and 7·5, respectively. Plants grown in soil receiving a full nutrient solution were slightly less resistant than those in the unfertilized series, but in no instance was there a breakdown of mature-plant resistance, suggesting that this type of resistance is not readily influenced by the application of fertilizer. The results obtained in this study are not considered sufficiently consistent to explain the nature of mature-plant resistance. A daylight period such as that prevailing in Peru or Kenya would be insufficient of itself to account for the breakdown in mature-plant resistance in Hope and similar varieties in these regions. It would appear, however, that there is an inherent tendency in Hope wheat to acquire resistance to stem rust as the tissues become mature, and that very subnormal light conditions, moderately high temperatures, and other factors exert a repressive influence on this process.

PETERSON (R. F.). **Inheritance of resistance of H–44 and Hope Wheats to stem rust.**—*J. Hered.*, xxxi, 6, p. 272, 1940.

In connexion with a recent account by E. B. Babcock (*J. Hered.*, xxxi, pp. 132–133, 1940) of the chronology of Hope and H–44 wheats, developed by E. S. McFadden (*J. Amer. Soc. Agron.*, xxii, pp. 1020–1034, 1930) from a cross made in 1916 between Marquis wheat and Yaroslav emmer, the writer briefly refers to the early work of Goulden, Neatby, and Welsh [*R.A.M.*, viii, p. 29] an abstract of which was published in *Anat. Rec.*, xxxvii, p. 182, 1927, on the mode of inheritance of these varieties to stem rust [*Puccinia graminis*] and to other outstanding American contributions on the subject.

COTTER (R. U.). **Unseasonable germination of teliospores of Puccinia graminis tritici.**—*Phytopathology*, xxx, 8, pp. 689–691, 1940.

During the past ten years none of the teleutosori of all the available races of *Puccinia graminis tritici* collected in Minnesota in the late summer or early autumn and kept outdoors over winter have given rise to germinating spores before March of the following year. However, barberry plants inoculated on 2nd October, 1939, with teleutospores of the rust from a Colorado collection on *Elymus* and *Agropyron* contracted heavy infection, which also resulted from mid-November inoculations of the same host with teleutospores from *A. smithii* collected in Colorado after the first collection. Race 8 of *P. graminis* was identified from the material of both lots, the teleutosori in which had evidently been formed in the late summer of 1939. In further tests, two out of five barberry plants inoculated in early November with teleutospores from durum wheat collected in Minnesota developed severe infection and one showed mild symptoms, the other two remaining healthy. The rust culture contained race 44 of *P. g. tritici*. Varying degrees of infection also occurred on 12 out of 15 barberries inoculated at 4- to 6-day intervals in early December. Teleutospores of the rust collected in Minnesota on Marquis wheat and Bond oats showed very little viability compared with those from durum, only a few pycnidia developing from inoculations with these collections.

The cause of this exceptional behaviour is not apparent, but it is evidently not associated with alternate wetting and drying or freezing and thawing [*R.A.M.*, xi, p. 230], the autumn of 1939 having been one of the driest on record for the State, with an abnormally high mean temperature.

COTTER (R. U.). **An unusual telial collection of Puccinia graminis.**—*Phytopathology*, xxx, 8, pp. 693–695, 1940.

When teleutospores of a collection (No. 7990) of *Puccinia graminis* on *Agrostis* from Minnesota were used to inoculate barberry [see preceding abstract], aecidiospores resulted which were capable of infecting barley. This uredospore culture proved to be race 11 of *P. g. tritici*, an unexpected result since the original collection was not on wheat. Crosses between this *Agrostis* collection and *P. g.* vars. *tritici*, *secalis*, and *agrostidis* yielded other races of *P. g.* vars. *tritici*, *secalis*, and possibly one of *agrostidis*. One of the *tritici* races (160) from a cross with *P. g.*

var. *secalis* was different from any previously identified. The identity of the *Agrostis* collection was not indisputably established, but it was either var. *agrostidis* or a hybrid so different from the other vars. of *tritici* or *secalis* as to be unable to attack barley.

SHEN (C. I.). **Soil conditions and the Fusarium culmorum seedling blight of Wheat.**—*Ann. appl. Biol.*, xxvii, 3, pp. 323–329, 1940.

In studies on the seedling blight of wheat caused by *Fusarium culmorum* [*R.A.M.*, xvii, p. 229], carried out at the Imperial College of Science and Technology and Rothamsted Experimental Station by means of the glass tumbler technique [ibid., xviii, p. 172], the intensity of infection was found to be correlated with the density of the spore suspension used to inoculate dry seed, the disease rating (expressed as a percentage of the maximum possible incidence) increasing from 56 to 91 as the concentration of spore suspension was raised from 220 to 166,000 spores per c.c. This correlation was much less significant and the intensity of infection much lower when seed was soaked for 48 hours prior to inoculation and planting. An increase in the period of pre-soaking from 42 to 66 hours did not reduce the infection any further. It was found that the infection was unable to extend along the seminal roots, so that its spread can only be explained by the growth of the fungus through the soil. In allotment soil, the infection decreased from a disease rating of 100 at a soil moisture content of 30 per cent. saturation to 28 at one of 80 per cent., the corresponding decrease in sand of the same moisture contents being from 91 to 55. The intensity of infection was lowest at P_H 7·3 in sand culture and 6·4 in soil and increased in both when the P_H was lowered to 4·4 or raised to 8·1. In nutrient sand culture, infection was highest (disease rating 57) in the no-nutrient series and lowest (33) in that receiving the full nutrient solution (nitrogen, phosphorus, and potassium). The addition of nitrogen, either alone or in combination with phosphorus or potassium, was almost as effective (33, 34, and 37, respectively) in reducing infection as the full nutrient solution; phosphorus, either alone or with potassium, was markedly less effective (41 and 46, respectively); while potassium did not significantly reduce infection below the no-nutrient series (55).

VANTERPOOL (T. C.). **Present knowledge of browning root rot of Wheat with special reference to its control.**—*Sci. Agric.*, xx, 12, pp. 735–749, 2 figs., 1940.

In view of the increasing economic importance of the browning root rot of spring wheat (*Pythium* spp., chiefly *P. arrhenomanes* and *P. tardicrescens*) [*R.A.M.*, xix, p. 586] in the Canadian prairies, a review is given of the present knowledge of the disease with special reference to its control. It is pointed out that the constant cropping resulting from the grain and fallow system practised over wide areas of western Canada leads to an increased liability to browning root rot in the wheat crop following fallow. Since it has not been possible to devise a method of completely eliminating the pathogens in the soil, and since, furthermore, none of the common wheat varieties is immune from this disease, control measures must mainly aim at improving soil conditions so as to help the development of more vigorous seedlings. In the author's

experiments, practical control resulted from the application of ammonium phosphate (11–48), at the rate of 0·5 gm. per pot, to naturally infested field soil at the time of sowing, reducing the percentage of diseased crown roots to 48·1 from 61·9 in the control, and increasing the plant weight by 205·2 per cent. The increases obtained with small applications of ammonium phosphate were much greater than those from heavy applications of gypsum and sulphur, and the commercial use of the latter compounds is, therefore, not to be considered at present. Some evidence was obtained of the effect of triple superphosphate on the crown root development, indicating that there is no significant difference in the date of first appearance of crown roots between treated and untreated plants, but that subsequent growth in length is substantially increased in the former during the first few days. Nitrogenous fertilizers are of little or no value, if not actually harmful, when applied alone to phosphate-deficient soils, but once the phosphate deficiency is rectified, nitrogenous amendments are beneficial. The ploughing-under of crop residues partially alleviated the trouble and the value of non-cereal rotations, i.e., lucerne or sweet clover, is primarily due to the improvement in soil fertility they effect. Farm manure was the only organic material among those tested which gave adequate control comparable to that obtained with the phosphates, and its use before fallowing is consequently recommended as one of the major control measures. The importance is also stressed of using sound, clean seed of the most resistant varieties obtainable, of early and shallow sowing in a firm seed-bed, and of the control of wild grass weeds. It is emphasized that results of lasting value can only be obtained when the depletions in soil fertility and the lack of nutrient balance brought about by the present wasteful grain and fallow system of cropping are corrected.

TAPKE (V. F.). **Studies on the natural inoculation of seed Barley with covered smut.**—*J. agric. Res.*, lx, 12, pp. 787–810, 5 figs., 1940.

The inspection at the Arlington Experiment Farm, Virginia, of a number of lots of seed barley naturally infected by covered smut (*Ustilago hordei*) showed the most effective inoculum to consist, not of spores on the seed hulls [*R.A.M.*, xvii, p. 677], but of spores and extensive mycelial ramifications from germinated spores on the pericarps of the caryopses below the seed hulls. The occurrence of this inoculum beneath the hulls under natural conditions doubtless accounts for the repeated failure of attempts to combat the disease by superficial treatments with various fungicides. Moreover, the deep-seated infection underlying the hulls, unlike the superficial inoculum on the exterior of the seed, is highly resistant to cold after emergence.

A field study of spore dissemination and seed inoculation in 1935–6 on the Han River, Cusado, and Wisconsin winter varieties showed that all the covered smut spores are not held intact in the infected heads until threshing, as generally reported. A few days after the emergence of the smutted heads, the membranes enveloping the spores begin to split, thereby permitting early spore dissemination and the prompt inoculation of developing seed in sound heads. These processes are repeated throughout the growth, ripening, curing, and drying of the

standing and shocked grain, culminating only with the completion of threshing. All the spores reaching the seed do not lie dormant on the surface of the hulls until sowing, some settling beneath the hulls, or sending infection hyphae into this site, or both. Spores reaching the seed during threshing may also send infection hyphae beneath the hulls under certain conditions of moisture during storage, so that the activity of the pathogen beneath the hull may extend from the time of emergence of the heads until the sowing of the new crop.

In a further study on storage conditions, progressive increases in the atmospheric humidities (from 0 to 15 drops water per 1 pint jar) in which inoculated Norway C.I. 2535 seed-grain was stored resulted in corresponding rises in the incidence of smut (from 60·9 to 87·5 per cent. in an untreated lot and from 0 to 28 per cent. in one disinfected with copper carbonate dust) up to a point at which mould growth on the seed became conspicuous.

Two different types of emergence of covered smut heads are described, in one of which the heads fail to reach the auricles of the flag leaf and remain half enclosed in the boot, while in the other (chiefly represented by the standard winter varieties) they are fully exserted. Intermediate and irregular types have also been observed. It would appear from preliminary investigations that the variety, the physiologic race of *U. hordei* concerned, and the environmental conditions of the plants are factors involved in the different types of smutted head emergence.

Elliott (Charlotte) & Poos (F. W.). **Seasonal development, insect vectors, and host range of bacterial wilt of Sweet Corn.**—*J. agric. Res.*, lx, 10, pp. 645–686, 2 graphs, 1940.

In continued studies on the bacterial wilt of maize (*Aplanobacter stewarti*) [*R.A.M.*, xv, p. 573], data on the incidence of the disease were collected in several localities in the United States during a period of four years. At the Arlington Experiment Farm, Virginia, bacterial wilt was abundant (60 to 80 per cent. of the susceptible Golden Bantam variety being infected) and destructive in the years 1934, 1935, and 1937, in which the winter temperature was slightly below the normal mean of 35·1° F. (but well above 32°), slightly above normal, and above 40°, respectively, while in 1936, when the mean winter temperature was below 32°, there was little infection in the early leaf stage, and even later, when the disease had become general, most of the lesions did not develop beyond local leaf infections. Adults of *Chaetocnema pulicaria* were abundant early in the season in 1934, 1935, and 1937, but in 1936 they were much less abundant in May and June, gradually increasing in numbers and becoming numerous by the middle of August.

At Geneva, New York State, wilt was completely absent in 1936, when the mean winter temperature was below 32°, but in 1937, when it was well above 32°, 11 per cent. of the Golden Bantam plants were infected. On three occasions no specimen of *C. pulicaria* was found in 1936, although small numbers of this insect were probably present late in August, while 57 specimens of the beetle were collected in late August 1937, 18 per cent. of which proved to be infected with *A. stewarti* [ibid., xix, p. 467].

At Yonkers, in the same State, 9 per cent. of Golden Bantam plants

(3 per cent. of which were killed) were infected in 1935; in 1936, no wilt was found by the middle of June on 700 Golden Bantam plants, and only 4 per cent. was present by the middle of August; in 1937, 5 per cent. were infected early in the season and 99 per cent. when the plants were mature. On Long Island there was little wilt early in the season of 1936 but an abundance later. In 1937 there was more early wilt than in the previous year. The mean winter temperature for 1936 was below 30° and for 1937 above 38°.

In four years' tests with 28,769 insects representing 94 species belonging to 76 genera, *C. pulicaria* proved to be the only species of importance harbouring the wilt organism during winter and spreading infection during the growing season in the field. *C. denticulata* ranked next to *C. pulicaria* in numbers of adults from which *A. stewarti* has been isolated, but it is doubtful whether the wilt organism ever overwinters in adults of this species. The proportion of infested *C. pulicaria* beetles was greater when the insects were caged on infected maize than when they were collected in the field, from 60 to 95 per cent. of the caged beetles yielding the organism in 1935. The wilt organism was isolated from *C. pulicaria* beetles collected at the Arlington Farm in every month of the year, giving fresh proof that the organism overwinters in hibernating adults of this beetle. Similar data were obtained in other localities. *Euchlaena perennis* was found to be an additional host of the wilt organism.

SANSOM (T. K.). **Breeding Diplodia resistant varieties of Maize.**—*Rhod. agric. J.*, xxxvii, 8, pp. 442–444, 1940.

Diplodia disease of maize [*D. zeae* and *Gibberella saubinetii*: *R.A.M.*, xix, p. 642] is prevalent throughout Rhodesia, where infection may reach 100 per cent. in some crops, the amount developing depending on the season and the locality. Severity is greatest in the best maize-growing areas, and no variety grown locally shows any high resistance. In Matabeleland incidence is less than in Mashonaland, where the rainfall is heavier, but in a very wet season in Matabeleland the Hickory King, Salisbury White, and Potchefstroom Pearl varieties may be as severely infected as in Mashonaland.

Selections have been made from crosses between the white dent variety, Johnson's County White, and a good type of Salisbury White; tests made with seed of this hybrid in a season very favourable to spread gave only 2 to 9 per cent. infection, the former figure being obtained from a flinty grain of the type on which selections are based. Commercial seed samples seldom contain under 50 per cent. diseased grains. Preliminary trials suggest that this hybrid will also equal the standard white dent varieties in yield. Further improvement of the variety is being attempted and seed is not available for distribution at present.

WAGER (V. A.). **The navel-end-rot, splitting, and large-navel-end problems of Washington Navel Oranges in the Kat River Valley.**—*Sci. Bull. Dep. Agric. S. Afr.* 192, 20 pp., 12 figs., 1939.

Navel-end rot of oranges due to the fungus *Alternaria citri* [*R.A.M.*, xix, p. 401] was investigated in the packhouse and the field from 1936 to 1938 in the Kat River Valley, South Africa, where it has been present

with varying degrees of intensity for many years and has at times caused serious losses. It was noticed early in the investigation that many of the infected oranges had large (over 0·3 in. diam.), malformed, irregular shaped, or protruding navel ends. Of the infected oranges collected at the rate of 80 to 100 weekly from the packhouse, 88 per cent. of 400 fruits in 1936, 66 per cent. of 800 in 1937, and 77 per cent. of over 600 in 1938, had large navel ends. In 1936, the 80 trees under observation showed an average of five infected fruits per tree, of which 90 per cent. had large navel ends. In 1937, the 1,000 trees under observation showed an average of 7 infected fruits per tree, 60 per cent. of which had large navel ends. In 1938, the same 1,000 trees had an average of 15·1 infected fruits per tree, of which 76 per cent. had large navel ends. These results demonstrate the importance of large navel ends in connexion with the development of navel-end rot. A more serious problem than navel-end rot, which was shown to affect only about 6 fruits per tree in a normal season, is presented by split fruits, which occurred at an average of 11, 22, and 34 fruits per tree in various orchards during 1937 and 1938. Without exception, split oranges had large navel ends.

It has previously been found that *A. citri* and also quite frequently *Fusarium lateritium*, *Colletotrichum gloeosporioides*, and various other fungi could be isolated from healthy mature oranges [loc. cit.]. In order to investigate the conditions under which navel-end rot develops, oranges in all stages of ripeness were wounded with a knife and inoculated with dry spores of *A. citri*, half the wounds being deep, penetrating the juice sacs, and the other half shallow. In all deep wounds, typical rot developed, extending to the core of the fruit, while in none of the shallow wounds did the fungus penetrate through the rind and reach the flesh of the fruit. Similar results were obtained with *F. lateritium* and *Oospora citri-aurantii*, rot developing only when the wound pierced the flesh of the fruit. It is concluded that the fungus can pass from one juice sac to another but cannot pierce the white tissue. It usually enters the navel end of the young fruit shortly after the style dehisces and can become deep-seated between the primary and secondary ovaries, but it appears to grow, spread, and produce navel-end rot only in those cases where it comes into contact with a juice cell. In oranges with large navel ends this may occur more often, as the pressure producing the cracks at the navel end may also rupture a juice sac and the juice might reach and stimulate the development of the fungus.

Field observations showed that large navel ends are mainly due either to harsh weather conditions when the fruit is 0·2 to 0·3 in. in diameter or to probably abnormal water relationships when the fruit is over 1·5 in. The problem of navel-end rot thus appears to resolve itself into one of cultural practices designed to prevent the formation of large navel ends.

MAYNE (W. W.). **Report on comparative trials with perenox carried out at Balehonnur and Sidapur in 1939–40.**—*Plant. Chron.*, xxxv, 17, pp. 345–347, 1940.

In an experiment at Balehonnur, Mysore, in November, 1939, the effective leaf survival of coffee bushes sprayed against *Hemileia vastatrix* [*R.A.M.*, xix, p. 470] with 2–2–40 Bordeaux mixture was 42·3 per cent.

compared with 33·1 and 29·6 per cent. for perenox [cuprous oxide; ibid., xix, p. 454] in concentrations of $3\frac{1}{3}$ and $1\frac{1}{4}$ lb. in 100 gals., respectively. In another test at Sidapur in September, 1939, the leaf survival figures for the perenox ($3\frac{1}{3}$ lb.) and Bordeaux-treated plots were 55·1 and 54 per cent., respectively, while in a further series in April, 1940, the corresponding percentages for the two treatments were 35·8 and 30·5, respectively. The conflicting results of these trials, which preclude any definite appraisal of the relative merits of the two fungicides pending further observations, may possibly be explained on a meteorological basis, perenox having been more effective in the relatively dry climate of Sidapur than under the very humid conditions prevailing at Balehonnur.

OTERO (R. O.). **Experimentos sobre adherentes para fungicidas.** [Experiments on adhesives for fungicides.]—*Rev. cafet. Colombia*, viii, 105, pp. 2605–2606, 1940.

A tabulated account is given of the writer's experiments in 1937 to determine the relative merits of different adhesives used to supplement the standard fungicidal sprays for the control of coffee diseases (*Cercospora coffeicola* and *Colletotrichum coffeanum* [*Glomerella cingulata*]) in Colombia. The best results were given by the addition of lubricating oil to 5–6–50 Bordeaux mixture at the rate of 250 c.c. per 30 l., but a substantial degree of control was also effected by treatment with Bordeaux mixture at the same strength plus castor oil (300 c.c. per 30 l.), honey (1 or 2 lb. per 50 l.), or joiner's glue ($\frac{1}{2}$ lb. per 50 l.), and by the 4–4–50 concentration with the admixture of rosin soap (100 c.c. per 30 l.).

HARE (J. F.) & KING (C. J.). **The winter carry-over of angular leaf spot infection in Arizona Cotton fields.**—*Phytopathology*, xxx, 8, pp. 679–684, 2 figs., 1940.

Evidence is presented showing that the causal organism of angular leaf spot of cotton (*Phytomonas* [*Bacterium*] *malvacearum*) is capable of surviving the winter on seed left unpicked in the field, the percentages of infection in a greenhouse test in the seedlings produced by two lots of Acala seed collected from (*a*) old stalks and (*b*) the ground being 34·4 and 30, respectively, compared with 0 in another lot from a disease-free field. From these volunteer seedlings infection may be transmitted to the planted crop by means of irrigation water or wind-driven rains. Thus, in five experimental fields in 1939 the percentages of infected volunteer seedlings were 9·3, 57, 16·6, 35·7, and 15, respectively, and those of diseased leaves (on 23rd September) 100, 31, 100, 28, and 100, respectively, the corresponding figures for the stems being 52, 8, 33, 15, and 83, and for the bolls 11, 2, 10, 3, and 25, respectively.

This mode of spread may be counteracted by such practical measures as turning cattle on the fields after the harvesting of the crop, raking and burning the plant debris, and early cultivation to destroy the volunteer seedlings before irrigation [*R.A.M.*, xviii, p. 520].

NEAL (D. C.) & BROWN (H. B.). **Fusarium-wilt resistance of new strains and hybrid Cottons in Louisiana in 1939.**—Abs. in *Phytopathology*, xxx, 8, p. 705, 1940.

The maximum degree of resistance to cotton wilt (*Fusarium*) [*vasin-*

fectum: *R.A.M.*, xix, pp. 403, 592] in the Louisiana trials of 1939 were (in the order named) Delfos 925–425 (with only 0·4 per cent. infection), Dixie Triumph 06–366, Deltapine 12, Dixie Triumph 85, Dixie Triumph 62×D. & P.L. 10–44–531–62, and Miller 610, of which Deltapine 12 was the highest yielder and Dixie Triumph 85 the lowest; the highly susceptible Half and Half showed 87 per cent. infection. Stoneville 3–68, though moderately susceptible (25·5 per cent. infection), ranked third in the production of seed cotton.

SMITH (A. L.). **A regional study of the relationship of potash treatments to the development of Cotton wilt under widely varying conditions of soil and environment.**—Abs. in *Phytopathology*, xxx, 8, p. 707, 1940.

A combined summary of the results of two seasons' experiments (1937 and 1938) in 13 localities of nine States of the American Union to determine the effect of treatment with potash (32 and 64 lb. potassium oxide per acre) on the incidence of wilt [*Fusarium vasinfectum*] and yield in 12 cotton varieties [see preceding abstract] indicates significant reduction in the numbers of diseased plants and substantial increases of production for both potash levels as compared with the untreated control series; the increase of yield following the 64 lb. application was not, however, significantly greater than that of the 32 lb. Furthermore, the yield response of susceptible varieties was insufficient to counteract the losses from wilt. Diseased plants showed reduced staple length and seed weight and an increase in lint percentage as compared with healthy ones. Relative divergences in varietal susceptibility to infection in different localities seems to be partly due to variations in the extent of nematode infestation.

WATKINS (G. M.) & WATKINS (MATILDE O.). **A study of the pathogenic action of Phymatotrichum omnivorum.**—*Amer. J. Bot.*, xxvii, 4, pp. 251–262, 54 figs., 1940.

This is a full account of the authors' work on the root rot fungus *Phymatotrichum omnivorum*, a preliminary note on which has previously been noticed [*R.A.M.*, xix, pp. 147, 592]. The conclusion is reached that exudates from the mycelium of the fungus contain thermo-labile substances, probably enzymes, which are largely responsible for the destruction of cell walls in inoculated cotton, retama (*Parkinsonia aculeata*), and maize seedling roots.

WOLCOTT (G. N.) & MARTORELL (L. F.). **Epidemics of fungus disease control insect pests in Puerto Rico.**—*J. econ. Ent.*, xxxiii, 1, pp. 201–202, 1940.

Of a large consignment of *Thermesia* [*Anticarsia*] *gemmatilis* collected from a completely defoliated planting of velvet beans [*Mucuna deeringiana*] at the Isabela Substation, Puerto Rico Agricultural Experiment Station, in the autumn of 1939, over half were found to have been killed by a fungus identified by Vera K. Charles as *Spicaria rileyi* [*R.A.M.*, xv, p. 719] which, though developing too late to save the crop, destroyed all the caterpillars of the last instar.

A previous instance of insect control by a fungus in Puerto Rico dates

from 1923, when the cottony cushion scale, *Icerya purchasi*, was practically eliminated by *S. javanica* from certain citrus groves well protected by hills and bamboo windbreaks.

CHARLES (VERA K.). **An entomogenous fungus on Spider Mites on Water Hyacinth.**—*Mycologia*, xxxii, 4, pp. 537–540, 1940.

During the winter of 1938–9, the author observed in Florida a species of *Rhinotrichum* on spider mites (*Paratetranychus yothersi*) on the common water hyacinth *Piaropus* [or *Eichhornia*] *crassipes*. The fungus was confined to the insects, and did not spread over the surface of the leaves or penetrate the tissue of the plants. The mites were enmeshed in a fine web of white mycelium, in which many of them were dead. The parasitism of the fungus was established by placing leaves infested by active mites in paper bags, in which condition the fungus grew rapidly on the exterior and interior of the mites, all of which were dead in 18 hours.

The fungus, which is characterized by repent or suberect sterile hyphae, ascending, flexuous, closely septate fertile hyphae, 75 to 200 (or longer) by 1·5 to 2 μ, sometimes slightly enlarged below the septum, an ovate-conoid and sporiferous terminal cell, and ovoid, smooth, hyaline conidia, 2·5 to 3 by 1·5 to 2 μ, borne on sterigmata 1 to 2 μ long, along the whole length of the conidiophore, is named *R. depauperatum* n.sp. [with English and Latin diagnoses].

DRECHSLER (C.). **Three new Hyphomycetes preying on free-living terricolous Nematodes.**—*Mycologia*, xxxii, 4, pp. 448–470, 3 figs., 1940.

Full descriptions [with English and Latin diagnoses], are given of three new species of Mucedinaceous Hyphomycetes subsisting by the capture of free-living terricolous eelworms [cf. *R.A.M.*, xix, p. 593] and belonging to the same series as those discussed in an earlier paper [ibid., xvii, p. 36], viz., *Dactylella doedycoides* n.sp., *D. haptospora* n.sp., and *Tridentaria implicans* n.sp. In the author's previous paper the fungus which should have been given as *Dactylaria brochopaga* appeared, by a slip of the pen, as *Dactylella brochopaga* [ibid., xviii, p. 251].

DAVIS (W. A.). **Aspergillosis in wild Herring Gulls.**—*J. Bact.*, xl, 2, pp. 321–323, 1 fig., 1940.

Aspergillus fumigatus was isolated from the lungs and other internal organs of five wild herring gulls (*Larus argentatus* var. *smithsonianus*) out of over 60 found dying or dead near the East Boston airport, Boston Harbour, and cultured on Sabouraud's agar at 37° C., the identification being confirmed by C. Thom. The birds are thought to have acquired the disease as a result of feeding for several months on decaying vegetation.

MITRA (A. K.). **Otomycosis in a woman caused by Aspergillus niger Tieghem.**—*Curr. Sci.*, ix, 8, pp. 371–373, 1940.

Aspergillus niger was isolated from the ear of a 48-year-old woman [*R.A.M.*, xix, p. 654] at Allahabad and grown on a number of standard media, of which potato dextrose agar proved to be the most suitable. A point of interest in connexion with the primary phialides of the fungus

was their decrease in length from 25 to 35 μ in the original habitat to 15 to 20 μ in culture. Treatment with alcohol failed to effect a cure [ibid., xviii, p. 313].

CRONKITE (A. S.) & LACK (A. R.). **Primary pulmonary coccidioidomycosis: experimental infection with Coccidioides immitis.**—*J. exp. Med.*, lxxii, 2, pp. 167–173, 2 pl., 1 diag., 1940.

Following a brief review of the literature on inhalation infection with *Coccidioides immitis* [*R.A.M.*, xix, p. 594], the writers describe a laboratory technique for the inoculation of animals by this method, which produced primary pulmonary infection in 30 (42 per cent.) of the 72 guinea-pigs used in experiments at the Stanford University School of Medicine, San Francisco. Spherules were usually present in the older lesions, but not in the earlier ones, at which stage the process of transition from the chlamydospore to the spherule is still in progress and cannot be followed without the aid of a differential stain not at present available.

BARNSHAW (H. D.) & READ (W. T.). **Rhinosporidiosis of the conjunctiva.**—*Arch. Ophthal., N.Y.*, xxiv, 2, pp. 357–361, 2 figs., 1940.

Particulars are given of a case of rhinosporidiosis of the conjunctiva, due to *Rhinosporidium seeberi* [*R.A.M.*, xix, p. 218] in a 17-year-old male patient at the Cooper Hospital, Camden, New Jersey. Histological sections revealed structures of dimensions ranging from 20 to 250 μ in diameter, the large ones representing sporangia containing numerous spores, of which 16,000 were counted in receptacles measuring 140 μ.

PECK (S. M.), ROSENFELD (H.), & GLICK (A. W.). **Fungistatic power of blood serum.**—*Arch. Derm. Syph., Chicago*, xlii, 3, pp. 426–437, 3 figs., 1940.

A tabulated account is given of experiments at the Mount Sinai Hospital, New York, showing the fungistatic (as distinct from fungicidal) influence of human blood serum, in concentrations of 30 per cent. and upwards, on cultures of *Trichophyton gypseum* in Sabouraud's bouillon.

ARAKI (M.). **Studien über die Dermatomykosen und ihre Erreger in Korea. I. Mitteilung. Trichophytie in Soeul.** [Studies on the dermatomycoses and their agents in Korea. Note I. Trichophytosis in Soeul.]—*Jap. J. Derm. Urol.*, xlvii, 5, p. 120, 1940.

The relative prevalence of the fungi in 39 isolates from 113 cases of trichophytosis in the Soeul district of Korea was as follows: *Microsporon japonicum* [*R.A.M.*, xvii, p. 818] 11, *Sabouraudites ruber* [*Trichophyton rubrum*] 9, *S. interdigitalis* [*T. interdigitale*] 9, *S. asteroides* [*T. mentagrophytes*] 6, *Epidermophyton inguinale* [*E. floccosum*] 2, and *T. pedis* [ibid., xix, p. 654] and *Bodinia violacea* [*T. violaceum*] 1 each.

TAKAHASHI (S.) & YOH (T.). **Über die Trichophytie in Nord- und Mittel-Formosa.** [On tricophytosis in north and central Formosa.]—*Jap. J. Derm. Urol.*, xlvii, 5, p. 120, 1940.

From 1,349 cases of ringworm of the scalp in north and central

Formosa, *Grubyella japonica* [*Microsporon japonicum*] was isolated in 887, *Bodinia violacea* [*Trichophyton violaceum*] in 379, *B. glabra* [*T. glabrum*] in 33, *Sabouraudites coccinea* [*T. coccineum*: *R.A.M.*, xiii, p. 769] in 92, *S. radiolatus* [*T. radiolatum*: ibid., xviii, p. 456] in 1, while 2 yielded hitherto undescribed species. From 31 cases of trichophytia eczematosa marginata and trichophytia vesiculosa *S. purpureus* [*T. purpureum*] was isolated in 17, *T. radiolatum* in 7, *M. japonicum* in 4, and *Epidermophyton inguinale* [*E. floccosum*], a variety of *S. gypseus* [*T. gypseum*], and an *E.* sp. in 1 each. *S. interdigitalis* [*T. interdigitale*] was isolated from 15 out of 18 cases of trichophytia pompholyciformis, *T. radiolatum* from 2, and *T. pedis* from 1.

Epstein (S. S.) & Snell (F. D.). **Gentian violet in Sabouraud's medium for isolation of pathogenic fungi.**—*Arch. Derm. Syph., Chicago*, xlii, 2, pp. 308–311, 1940.

In comparative experiments at Brooklyn, ordinary Sabouraud's medium (4 per cent. dextrose, 1 per cent. peptone, and 2 per cent. agar) and the peptone-free dextrose medium of Legge *et al.*, with P_H values of 5·2 to 6 and containing 0·001, 0·0004, 0·0002, and 0·0001 per cent. gentian violet, were heavily inoculated with stock *Trichophyton* (*T. interdigitale* and *T. rosaceum*) cultures, with and without added profuse bacterial contamination, and also with primary impure growths of *T.* arising from human infections, and maintained at room temperature. Gentian violet was found markedly to inhibit the development of the usual bacterial flora of the skin without impeding that of the fungi, the best results being secured by the addition of 0·0002 per cent. (1 : 500,000) of the dye to plain Sabouraud's medium at P_H 5·8 prior to sterilization. Of 44 fungi isolated from 62 lesions in 131 cases of clinical dermatophytosis in an orphanage, 33 (75 per cent.) were obtained on the plain medium as compared with 42 (95·5 per cent.) on the same with added gentian violet. The fungi isolated were *T. interdigitale* (39), *T. rosaceum* (2), *E.* [*T.*] *rubrum* (2), and *Monilia* [*Candida*] *albicans* (1).

Danbolt (N.). **Deep cutaneous moniliasis, a fatal case of a peculiar type.**—*Acta derm.-venereol., Stockh.*, xxi, 1, pp. 98–117, 7 figs., 1940. [German and French summaries.]

The fungus isolated from infiltrations in the skin of a 78-year-old male patient at the Oslo State Hospital in 1938 was characterized on Sabouraud's medium by flat, white colonies, up to 8 mm. in diameter, the border of which consisted of oval blastospores, 5 to 7 by 3 to 5 μ, and the centre of round and oval yeast-like cells, some in process of forming hyphae, 2 to 3 μ in diameter. Blood agar gave rise to small, shiny, stellate colonies, with masses of blastospores in the points of the stars and hyphae in the medium only. The organism fermented glucose, levulose, and maltose, producing acid and gas, the former only being evolved from galactose, saccharose, and dextrin. Gelatine was not liquefied or milk coagulated. The fungus is tentatively identified as *Monilia* [*Candida*] *stellatoidea* [*R.A.M.*, xix, p. 596]. Inoculation experiments on laboratory animals gave negative results.

HUMPHREY (A. A.). **Reticuloendothelial cytomycosis (histoplasmosis of Darling).**—*Arch. intern. Med.*, lxv, 5, pp. 902–918, 3 figs., 1940.

This is a detailed account of the clinical, histological, and microscopic features of two fatal cases, one in a 17-year-old and the other in a 46-year-old male, both in Michigan, of Darling's histoplasmosis (*Histoplasma capsulatum*) [*R.A.M.*, xix, p. 654], for which the author proposes to substitute the more apt name of reticuloendothelial cytomycosis in accordance with De Monbreun's studies on the disease [ibid., xiv, p. 445]. In connexion with a discussion on the etiology of the disorder, it is mentioned that M. Moore, *in litt.*, expressed the opinion that, in addition to *H. capsulatum*, another closely related fungus is concerned in the production of the disease. There is evidence to suggest that the ear is a primary channel of infection.

WITTICH (F. W.). **The nature of various mill dust allergens.**—*J. Lancet*, N.S., lx, 9, pp. 418–421, 1940.

The results of a four-year survey and study of the nature of the various mill dust allergens in Minnesota [*R.A.M.*, xvi, p. 38] are presented, together with clinical observations. Among the air-borne allergens observed in mill dust in 1938 were various cereal smuts and rusts, and species of *Helminthosporium*, *Fusarium*, *Penicillium*, *Alternaria*, *Hormodendrum*, *Acrothecium*, and *Syncephalastrum*. Of 135 patients tested for their reaction to some of the above-mentioned organisms [cf. next abstract], 82·9 per cent. were clinically sensitive to the common air moulds [ibid., xix, p. 594], 76·3 per cent. to the smuts, and 62·9 per cent. to grain mill dust. The mill dusts were found to induce anaphylaxis in guinea-pigs and there is an antigenic relationship between the grain dusts and their smut parasites. In the Grain Belt region the smuts have been found to act as definite excitants of hay fever and asthma and in some cases to be quite toxic.

WALDBOTT (G. L.) & ASCHER (M. S.). **Rust and smut, major causes of respiratory allergy.**—*Ann. intern. Med.*, xiv, 2, pp. 215–224, 2 graphs, 1940.

Since July, 1938, the writers have charted the number of spores of rust (*Puccinia graminis*) and smuts (*Ustilago levis* [*U. kolleri*] on oats and *U. zeae* on maize) found on vaseline-coated slides exposed for 24-hour periods at Detroit, Michigan. The first uredospores of *P. graminis* developed about 15th July and reached a peak on 21st. Another rise in the spore count on 30th July was probably due mainly to the smuts. *Alternaria* was present throughout the period of the observations.

Scratch and intradermal skin tests were performed on 106 patients with filtered extracts of the above-mentioned fungi, *Hormodendrum*, and *Penicillium* [see preceding abstract], as a result of which three categories were established, viz., 7 persons developing clinical reactions during the rust and smut season, 12 suffering definite exacerbation of their symptoms at this period, and 87 giving no particular seasonal manifestations. Details are given concerning two patients in whom the intradermal skin test for *P. graminis* induced generalized reactions and asthmatic attacks were provoked by inhalation of rust powder.

On the basis of these data the authors regard sensitivity to rust and smuts as an important factor in seasonal allergy of the upper respiratory tract.

ROBINSON (B. B.). **Flax-fiber production.**—*Fmrs' Bull. U.S. Dep. Agric.* 1728, 28 pp., 13 figs., 1940.

Popular notes are given (pp. 13–16) on the following diseases affecting fibre flax in the United States: wilt (*Fusarium lini*), rust (*Melampsora lini*), pasmo or rust blotch (*Phlyctaena linicola*) [*Sphaerella linorum*: *R.A.M.*, xviii, p. 739], anthracnose (*Colletotrichum linicola*), and heat canker. The relatively mild form assumed by wilt of recent years in Michigan and Oregon is attributed to the use of new land or of areas from which flax has been excluded for some time.

CASTILLO (B. S.) & CELINO (M. S.). **Wilt disease of Abacá, or Manila Hemp (Musa textilis Née).**—*Philipp. Agric.*, xxix, 1, pp. 65–85, 5 figs., 1940.

A full account is given of the writers' inoculation experiments to determine whether the agent of abacá (*Musa textilis*) wilt in the Philippines is identical with that of banana wilt (*Fusarium oxysporum* f. 3) [*F. oxysporum* var. *cubense*: *R.A.M.*, xix, p. 347]. The symptoms induced by infection with pure cultures of the fungus from Davao included inward curling of the leaf blades at or near the lower leaf tips, bunching of the foliage, slow growth of the plant, and violet discoloration of the vascular bundles; there was no cracking of the pseudo-stem similar to that caused by the same organism in Latundan bananas. Infection of both abacá seedlings and banana suckers was secured either by the application of pure cultures directly on the corms or by the admixture of the inoculum with sterilized soil. Fresh injuries on the roots and corms were not a necessary condition of infection in either host. In the case of four-month-old abacá seedlings, all the 58·3 per cent. infected plants succumbed to the disease, whereas at one year only 14·3 per cent. died though 35·7 per cent. developed wilt symptoms. An incubation period of one to four or two to six months elapsed between inoculation and the appearance of symptoms in abacá and banana, respectively. The severity of wilt in the experimental abacá plantings was aggravated by injuries inflicted by the corm weevil, *Cosmopolites sordidus*.

The outcome of these trials, supported by that of morphological and cultural studies, is considered to establish the identity of the abacá wilt fungus with *F. oxysporum* var. *cubense*, the spread of which should be prevented by the destruction of infected plants and those surrounding it within a radius of 10 m., the exclusive use of healthy material for planting, and other sanitary measures to restrict the movement of the parasite into areas not yet affected.

KIRBY (R. S.). **Alternaria branch rot on Carnation cuttings.**—*Flor. Exch.*, xciv, 1, p. 11, 1940. [Abs. in *Biol. Abstr.*, xiv, 6, p. 1063, 1940.]

The best control of *Alternaria* [? *dianthi*] on Puritan carnation [*R.A.M.*, xix, p. 477] cuttings was secured by ten minutes' immersion in 1 in 1,000 potassium permanganate, followed by rinsing and the

dipping of the ends in naphthalene acetic dust, though treatment with either potassium permanganate or naphthalene acetic dust alone was also effective. The dual treatment reduced infection to 5 per cent. of the cuttings compared with 60 per cent. in the controls. Washing the sand to eliminate humus was beneficial only in the case of untreated cuttings.

GREGORY (P. H.). **The control of Narcissus leaf diseases. I. White mould and fire on 'Golden Spur'.**—*Ann. appl. Biol.*, xxvii, 3, pp. 338–347, 1940.

A detailed description is given of spraying tests carried out in west Cornwall and the Scilly Isles from 1935 to 1939 on commercial stocks of the *Narcissus pseudo-narcissus* variety Golden Spur, a preliminary account of which has already been noticed [*R.A.M.*, xix, p. 97]. Three applications of Bordeaux mixture 4–4–40 or 4–3–40 prepared with hydrated lime, the first when the shoots are 4 to 6 in. high and the other two at monthly intervals, gave practically complete control of white mould, *Ramularia vallisumbrosae*, and satisfactory control of fire, *Sclerotinia polyblastis*. This treatment gave excellent results under conditions favourable to epidemic attacks, but in normal seasons a single application made shortly after flowering would probably suffice. Bordeaux mixture not only prevented primary infection of the leaf tips from sclerotia on the ground and arrested secondary spread, but also checked the development of sclerotia of the two fungi on the leaves, thus reducing the risk of the soil becoming contaminated. Cuprous oxide suspensions were fairly effective but inferior to Bordeaux mixture; sulphur fungicides proved to be of no practical value in controlling the two diseases. In the absence of disease, spraying of the variety Cheerfulness with Bordeaux mixture had no effect in increasing the crop.

CORMACK (M. W.). **Phytophthora cactorum as a cause of root rot in Sweetclover.**—*Phytopathology*, xxx, 8, pp. 700–701, 1940.

The fungus responsible for a destructive root rot of sweet clover [*Melilotus*] occurring in Alberta was identified by S. F. Ashby as *Phytophthora cactorum*, to which F. R. Jones now also attributes a closely similar disease in the United States formerly ascribed to *P. megasperma* [*R.A.M.*, xix, p. 101], since found to be only weakly pathogenic, if at all, to the host in question. This is apparently the first record of *P. cactorum* on sweet clover. So far, the damage caused by the root rot in Alberta has been restricted to scattered field or roadside plants, but its potential importance may be gauged by the mortality of 20 per cent. observed in one locality in June, 1939. Inoculation experiments with several isolates of *P. cactorum* on sweet clover and lucerne roots resulted in a rapid wilt of the former but were negative on the latter. Mature plants appear to be more susceptible than seedlings, the average infection ratings of second-year plants in the flowering stage and two-month-old seedlings being 90 and 60 per cent., respectively.

WEIMER (J. L.). **Root rot of Austrian Winter Peas and Vetches.**—Abs. in *Phytopathology*, xxx, 8, p. 708, 1940.

Austrian winter [field] peas (*Pisum* [*sativum* var.] *arvense*) and

vetches are liable to more or less extensive damage from a root rot associated with a yellow discoloration, dwarfing, and gradual death of the tops, a characteristic feature in vetches, especially Monantha [*Vicia monantha*=*V. calcarata*], being the development of a reddish colour. The early stage of decay may develop as early as December, but the plants do not usually die until the late winter or early spring. The disease is most severe during wet seasons. The oospores of a species of *Aphanomyces*, probably *A. euteiches* [*R.A.M.*, xviii, p. 777], are present in the affected roots, and this fungus is thought to be a major factor in the initiation of infection; other organisms commonly found in the diseased tissues included *Pythium graminicolum, P. irregulare, Rhizoctonia* sp., and *Fusarium* sp., of which the three first-named are capable of causing rots of varying extent under favouring conditions. Control measures should be based on an appropriate manuring scheme, good drainage, and protracted crop rotation. Hairy [*V. villosa*], Smooth, Light-Seeded Hungarian, and Hungarian [*V. pannonica*] vetches and *V. hybrida* are fairly resistant, Woolly Pod, *V. calcarata*, and Common [*V. sativa*] susceptible. No resistant variety of peas has been observed.

Kroulik (J. T.) & Gainey (P. L.). **Relative nodulation of varieties of Medicago sativa varying in susceptibility to Alfalfa wilt.**—*Soil Sci.*, l, 2, pp. 135–140, 1940.

No evidence was forthcoming in a series of tests at the Kansas Agricultural Experiment Station of any correlation between the resistance of Kansas Common (and a wilt-resistant selection of the same, Ladak) and Turkestan lucernes to infection with *Rhizobium meliloti* on the one hand and *Phytomonas insidiosa* [*Aplanobacter insidiosum*] on the other.

Muskett (A. E.) & Calvert (E. L.). **Blind seed disease of Rye-Grass.**—*Nature, Lond.*, cxlvi, 3693, pp. 200–201, 1 fig., 1940.

Observations in Northern Ireland confirm the view that *Pullularia* sp. and the fungus associated with blind seed disease of rye grass [*Lolium perenne* and *L. multiflorum*] may be present on one and the same seed [*R.A.M.*, xix, p. 542]. The *Pullularia* conidia are small and yeast-like, whereas those of the other organism are larger, allantoid, and more regular in size and shape. The former fungus is generally associated with the glumes and the exterior of the caryopsis, while the latter is found only in and on the caryopsis.

Heads of commercial perennial rye grass turves in full flower were inoculated with the following spore suspensions, viz., conidia of *Pullularia* sp. and the blind seed fungus from Northern Ireland, conidia of the latter from New Zealand, a suspension of ascospores from *Helotium*-like apothecia growing from dead rye grass seeds in the field where the turves were cut (these apothecia markedly resembling those described from New Zealand [ibid., xviii, p. 601], their detection apparently constituting a first record of their occurrence elsewhere), and sterile water. The results obtained showed that the seeds in the controls and those in the heads inoculated with *Pullularia* were all healthy. The heads inoculated with the Northern Ireland and New Zealand strains of the blind seed fungus and the ascospore suspension showed, respectively, 10·6, 5·4, and 7·6 per cent. diseased seeds.

It is concluded that the *Helotium*-like apothecium is the perfect stage of the blind seed fungus, cultures from single ascospores resembling those of the latter in every respect. The *Pullularia* is probably saprophytic, and the disease should be known by Neill's name 'blind seed disease', rather than '*Pullularia* disease'.

BROOKS (C.). **Gas storage.**—*Canad. Chem. Process Industr.*, xxiv, 3, pp. 111–112, 1940.

In this abstract of a paper presented at the Eastern Air Conditioning Conference in November, 1939, the author comments on the rapid development of gas storage for apples in England, where over 200 plants are in operation. One of the chief reasons for this advance is considered probably to lie in the susceptibility of many English-grown apples to low-temperature breakdown, necessitating their storage at 38° to 40° F. instead of at the usual refrigeration temperature of 32°. These considerations do not generally apply in North America, where successful results are obtained by ordinary cold storage methods, but possibly growers of McIntosh or other varieties susceptible to soft scald or soggy breakdown might be well advised to construct private gas storage plants. The value of the treatment in the storage of other fruits is also discussed.

MOORE (M. H.). **A brief review of research work at East Malling on the control of Apple scab.**—*Rep. E. Malling Res. Sta., 1939*, pp. 75–76, 1940.

In this brief review of fourteen years' research work at East Malling and elsewhere on spraying for the control of apple scab [*Venturia inaequalis*] the author states that so far lime-sulphur is still the standard fungicide for the purpose, as other sprays, while perhaps safer to use, have not equalled it in fungicidal efficiency, except when used at uneconomic concentrations. It is also the most valuable material against mildew [*Podosphaera leucotricha*]. The addition of ferrous sulphate (for added safety) was found to blacken the spray, and the use of cottonseed oil with Bordeaux mixture proved expensive, and the mixture was not altogether safe on apples. In all diseases controllable by protective spraying the chief problem is spray injury. Evidence was obtained that the incidence of apple scab and of spray damage resulting from attempts to control it is closely related to environmental factors, including locality, weather, and soil. A study of these factors is essential to further progress, and experiments are already in progress to determine the influence of cover-cropping, soil moisture content, and manuring on the susceptibility of host plants to disease and spray injury.

LUGEON (A. R.). **Storage scab of Apples.**—*Gdnrs' Chron.*, cvii, 2791, p. 315, 1940.

Experiments at the Cantonal Station of Arboriculture, Marcelin-sur-Morges, Switzerland, are stated to have shown that the best control of storage scab of apples (*Venturia inaequalis*) [*R.A.M.*, xv, pp. 135, 588; xix, pp. 354, 547] is obtained by the application, during the latter part of August or early September, dependent on weather conditions, of a dilute 'solution' (0·15 per cent.) of a brand of copper carbonate with

a high copper content. The solution leaves no trace at picking time even on varieties sensitive to russeting by sprays.

WORMALD (H.). **The angular leaf spot of Apple trees.**—*Rep. E. Malling Res. Sta., 1939,* pp. 63–66, 4 figs., 1940.

The angular leaf spot of apple leaves, first observed in England in 1937, and attributed by Moore to *Phyllosticta angulata* [*R.A.M.*, xviii, p. 400], again appeared at Lingfield, Surrey, in 1938, when no fungal fructifications were observed on the lesions, and in 1939 was seen at Kirdford and Fittleworth (Sussex), Alton (Hampshire), Danbury (Essex), Paddock Wood (Kent), and, on a single leaf, at Brenchley (Kent). The most severe outbreak was at Kirdford, where, in a few cases, nearly all the leaves on a spur were rather severely affected, though the infected trees seldom showed more than a few diseased spurs. The varieties most seriously affected were Worcester Pearmain, Bramley's Seedling, King of the Pippins, and Blenheim Orange. The condition occurred on all the trees in one field (where the trees were in grass); in cultivated plantations it was much less common and less severe. Some of the spots showed the presence of a *Phyllosticta* which differed from that described by Wenzl [loc. cit.] in that the pycnidia were larger and had larger pores, and the spores had mostly two oil drops. In spore size and presence of oil drops the fungus agreed with that described and figured by Salmon in 1908 and included by Grove (1935) [ibid., xv, p. 53] under *P. mali*, but Salmon's fungus occurred on large, almost circular spots.

In parallel culture on the same medium the Kirdford fungus and *P. angulata* from Wenzl's material behaved differently in growth rate and general habit; the two fungi are not, therefore, identical, though they may be divergent forms within one species.

At present there is no evidence that the disease produces premature leaf fall or weakens the trees.

In an appendix to this paper it is stated that Massee and Steer in May, 1940, found a similar but dark brown or reddish-brown angular leaf spot of apple and pear at Tenterden, Kent, associated with severe infestation by the froghopper *Cercopis sanguinea* Geoff. and have established that the froghopper is the cause of the spots. In June, 1940, the authors received apple leaves also showing dark brown, angular spots from an orchard where angular leaf spot had been present in 1939, and were informed that froghopper infestation was abundant. Observations are being continued to ascertain whether the greyish-brown and dark brown spotting are phases of the same disorder.

NIEDERHAUSER (J. S.) & WHETZEL (H. H.). **Observations on the varietal susceptibility of Apples to Gymnosporangium juniperi-virginianae.**—*Phytopathology*, xxx, 8, pp. 691–693, 1940.

The apple varieties tested in 1939 at Ithaca, New York, for their reaction to *Gymnosporangium juniperi-virginianae* reacted as follows [cf. *R.A.M.*, xiii, p. 312; xix, p. 659]: Yellow Transparent, Wagener, Lady, McIntosh, Dutchess of Oldenburg, Rhode Island Greening, Chenango Strawberry, Baldwin, Northern Spy, Red Astrachan, Sutton (Beauty), Red Delicious, Hubbardston, and Pound Sweet (?) were

immune; Golden Delicious, Mother, and Roxbury Russett very resistant; Westfield Seek-No-Further resistant; Ensee and Tomkins King susceptible; and Twenty Ounce, Yellow Bellflower, Winter Banana, Wealthy, and Summer Rambo very susceptible.

WELLMAN (R. H.) & HEALD (F. D.). **The toxicity of certain chemicals in aqueous solutions to spores of Penicillium expansum.**—*Phytopathology*, xxx, 8, pp. 638–648, 1 fig., 1940.

In an attempt to find a substitute for sodium hypochlorite, the use of which for the control of *Penicillium expansum* on apples in the Pacific North-West [*R.A.M.*, xvii, p. 505] is attended by various disadvantages, the writers tested a number of chemicals in aqueous solutions, strong claims for one of which (sodium ortho-phenylphenate) as a remedy for this type of decay [cf. ibid., xix, p. 289] have been advanced by commercial concerns. The spores used in the experiments were derived from 7- to 15-day-old colonies on 2 per cent. potato dextrose agar at 68° F., the resistance of which to *P. expansum* has been shown by K. F. Baker (in an unpublished thesis, Washington State College, 1934) to be greater than that of older material. All the exposures were made for a period of one minute.

A concentration of 4,000 p.p.m. of sodium ortho-phenylphenate was found to kill the spores at 68° in the absence of organic matter, while at 110° it is effective under the same conditions at 3,000 p.p.m. Exposure to air causing decomposition of this compound, the solubility of each lot should be tested before appraising its value. A mixture of sodium tetrachlorophenate and sodium 2-chloro-ortho-phenylphenate [ibid., xviii, p. 364] proved to be more toxic to *P. expansum* at 68° than either pure sodium tetrachlorophenate or sodium ortho-phenylphenate, destroying a high percentage of the spores at 2,500 p.p.m.

Of nine triphenylmethane dyes investigated, only crystal violet, gentian violet, and malachite green were toxic to the mould spores at 1,000 p.p.m., these limited data being considered to support Thornberry's evidence in favour of a relationship between the number of methyl groups attached to the amino-nitrogens and their fungicidal activity [ibid., xi, p. 525]. None of the twelve miscellaneous dyes tested showed any fungicidal activity at the maximum concentration of 1,000 p.p.m., while of various organic disinfectants included in the trials, only sodium salicylate and thymol completely inhibited colony formation by *P. expansum* at a strength of 10,000 p.p.m.

Of the 25 inorganic chemicals tested, chromium trioxide, potassium dichromate [ibid., xviii, p. 441], and sodium thiosulphate exerted a fungicidal action at 10,000 p.p.m., while iodine, mercuric chloride, and potassium mercuric iodide were effective at 1,000.

It is pointed out that these results are not to be interpreted in terms of blue mould decay control, but merely as indications of possible lines of approach to this problem.

SIEGLER (E. A.) & BOWMAN (J. J.). **Root responses of noninfectious hairy root Apple seedlings under different methods of propagation.**—*J. agric. Res.*, lx, 11, pp. 739–754, 5 figs., 1940.

The name 'non-infectious hairy root', as distinct from infectious

hairy root caused by bacteria [*Bacterium rhizogenes*: *R.A.M.*, xvi, p. 191], is proposed for the disorder of apple trees characterized by an excessive number of lateral roots on the main root in the region extending from the collar to a distance of several inches below the ground line. Up to the present no evidence has been found pointing to a pathogen being involved in this condition, although the possibility that a virus may be an etiological factor should not be disregarded. Experiments with apple seedlings from various seed sources, including French crab, conducted during the years 1936 to 1938, showed that progeny from commercial (domestic) varieties were particularly affected by the disorder. Field counts indicated that approximately 20 per cent. of the average run of domestic seedlings exhibited the symptoms. The only exception was the variety Delicious, which showed a comparatively small percentage of affected seedlings and is stated to make exceptionally good root graft unions. The inherent or genetic nature of the disorder was experimentally demonstrated and it was shown that the symptoms are influenced by the degree of stem rooting. It is concluded that the use of any portion of seedlings affected by non-infectious hairy root in propagation will result in manifestation of the symptoms unless the scion variety develops vigorous scion roots. Nurserymen commonly discard all trees showing symptoms of the disorder, and in order to avoid this loss no part of affected seedlings should be used for propagation purposes. It is suggested that selections from clones that exhibit pronounced symptoms may readily furnish sources for dwarfing rootstocks.

Reyneke (J.) & Stubbings (W. A. K.). **Oil sprays in relation to the development of scald in Bon Chrétien Pears.**—*Fmg S. Afr.*, xv, 173, pp. 313–314, 324, 1940.

During recent years scald [*R.A.M.*, xvii, p. 468] caused such serious damage to Bon Chrétien pears in South Africa that the commercial value of this variety has become questionable. Coincident with this increase has been the use of heavy spraying against codling moth [*Cydia pomonella*] and drastic methods of arsenic removal. In experiments during the 1938–9 season the juice of Bon Chrétien pears sprayed with 1 per cent. summer oil emulsion (12 applications at weekly intervals) showed a lower sugar content than those sprayed on the same dates with lead arsenate and a spreader, indicating that the oil-sprayed pears were greener at picking time owing to the delaying action of the oil on the development of the fruit. The oil-sprayed pears, however, developed practically no scald in storage, which is considered to be due to the protective action of the oil layer on the fruit. On the other hand, fruit sprayed with lead arsenate developed 21·4 per cent. severe scald or 46·8 per cent. total (including those with slight symptoms) in storage, the percentage of total scald rising to 59·9, 71·0, and 92·0 in fruit dipped before packing in 1 per cent. hydrochloric acid for two or three minutes or in 1 per cent. hydrochloric acid with $\frac{1}{4}$ per cent. areskap [ibid., xviii, p. 598] for three minutes, respectively. None of the dipping treatments induced severe scald in oil-sprayed fruits, but 29·0 per cent. total (chiefly slight) scald developed when areskap was included in the treatment. The adverse effect of areskap is attributed to its solvent action on the protective mineral oil layer and the natural

waxes of the fruit, which would increase the susceptibility of the fruit to acid injury and scald. Dipping in acid increased the amount of internal breakdown [loc. cit.] in arsenate-sprayed fruits, but not appreciably so in those treated with oil. It is concluded that the oil forms a protective layer against cold injury and consequent scald and against acid damage. Possibly it also modifies the course of metabolism of the fruit on the tree and in storage. With regard to a practical application of these results, the use of oil in every spray of the programme is considered undesirable, since a heavy oil layer is detrimental to the fruit and the tree. The combined use of lead arsenate and oil emulsions, either together or apart, in the same spray programme is advocated, provided oil sprays are not applied after the beginning of December, as this would complicate residue removal.

Smolík (L.). **Natural ferromanganiferous concretions as remedy for chlorosis.**—*Trans. int. Soc. Soil. Sci., 1939*, pp. 95–97, 1939. [Received June, 1940.]

Natural ferromanganiferous concretions from podsols and podsolized soils were ground into a very fine powder and applied in May, 1930, to the roots of six two-year-old chlorotic Du Lectier pear trees [*R.A.M.*, xviii, pp. 36, 702] growing in loamy soils containing about 8 per cent. calcium carbonate at the Pomological College, southern Moravia, a total of 3 kg. being used for the six trees. By May, 1932, the trees treated by this method presented a fully normal appearance, whereas the controls and trees given copper or ferrous sulphate were completely defoliated. Other trees affected by chlorosis in the same district were apple [loc. cit.], plum [ibid., xvii, p. 687], weeping willow [*Salix babylonica*], *Acacia*, and maple [*Acer*].

Poole (R. F.). **The relation of nitrogen fertilization of the Peach to the control of Bacterium pruni.**—Abs. in *Phytopathology*, xxx, 8, p. 706, 1940.

Experiments were conducted to determine the effect of nitrogen on bacterial leaf spot of peaches (*Bacterium pruni*) in light sandy soils (to which the disease is practically restricted), 1 lb. nitrate being applied fortnightly to 12-year-old Elberta trees until a total of 6 lb. was reached. The treated trees contracted only mild infection and retained their dark green foliage until the onset of the frosts, whereas the leaves of the controls turned yellow, purplish, and red, and showed severe symptoms, including extensive defoliation. Chemical analyses of the leaves from both lots of trees revealed much higher concentrations of manganese, iron, calcium, potash, and magnesium in the treated than in the controls.

Mezzetti (A.). **Tumori sul colletto dei Mandorli.** [Tumours on the root-collar of Almonds.]—*Agric. lib.*, viii, 7, pp. 317–318, 1939.

Attention is drawn to the prevalence of crown gall (*Bacterium tumefaciens*) on the root collars of young almond trees in Libya. A degree of control may be effected by the excision of the tumours with a knife that has been flamed and disinfected in 10 per cent. copper or iron sulphate, treating the wounds with Bordeaux mixture, and leaving the

affected parts uncovered for the entire summer. The roots of apparently healthy trees which have been exposed to contact with diseased ones should be immersed for a couple of minutes in 1 per cent. Bordeaux mixture.

LUTTRELL (E. S.). **An undescribed fungus on Japanese Cherry.**—*Mycologia*, xxxii, 4, pp. 530–536, 9 figs., 1940.

For some years past *Prunus serrulata* trees grown as ornamentals at Duke University, North Carolina, have been infected by a fungus producing minute, black pustules towards the end of July on the surface of the young twigs. These pustules give rise to pseudoparenchymatous stromata and develop into acervuli, erumpent from the epidermal cells, and bearing erect, simple conidiophores, 40 by 4·5 μ over the upper surface. As the season advances, the acervuli become more prominent and the ruptured walls and cuticle are pushed back centrifugally to form a collar round the base of the acervulus, which is bordered by a layer of protective hyphae. The first stages of conidial formation occur in late March. Each cell of the conidiophore produces a sterigma at whose tip conidia are abstricted. As the distal cells of the conidiophore become exhausted they disintegrate and the protecting hyphae bend inwards. The conidia are unseptate, elliptic, at first hyaline, later light brown, 7 to 13 by 3 to 4·5 μ in diameter. After the conidia have been shed, the stroma and the basal portions of the protective hyphae remain as a shallow crater-like receptacle. In culture, the fungus formed masses of individual spherical to oblong or elliptical cells ranging from 7 to 25 μ in diameter, any one of them capable of producing one or more germ-tubes.

The fungus, while clearly being a member of the Melanconiaceae, is considered to be a new genus because of (1) the method of conidial formation and (2) the protective hyphae arising along the periphery of the stroma. This genus is named *Catenophora* n.gen., and the fungus itself *C. pruni* n.sp., Latin diagnoses being given both of the genus and of the species.

HARRIS (R. V.), BEAKBANE (A. B.), & MOORE (M. H.). **A review of research on cane spot of Loganberry and Phenomenal Berry.**—*Rep. E. Malling Res. Sta., 1939*, pp. 68–69, 1940.

In further experiments in 1939 at East Malling on the joint control of the loganberry beetle (*Byturus tomentosus*) and the cane spot fungus (*Elsinoe veneta*) [*R.A.M.*, xviii, p. 325] on loganberries and phenomenal berries [a distinct pomological variety of *Rubus loganobaccus*] two spraying schedules were compared, viz., (*a*) pre-blossom and beetle stage and (*b*) the same, plus a post-cropping application, using a proprietary brand of colloidal copper fungicide combined with derris at the beetle stage, and Bordeaux mixture at the others. The data obtained showed schedule (*b*) to be the more effective. Another test was laid down, in 1938, in which two methods of training the plants were combined with the following spray applications, viz., (*a*) no spray, (*b*) post-cropping spray, (*c*) pre-blossom spray in May, and (*d*) pre-blossom and beetle stage sprays. The same spray materials were used as in the other experiment, and the records made in 1939 showed marked reduction in the

disease in those plants receiving spray treatments (*b*) and (*d*), particularly the former. A differential effect of the training methods was also noted.

WORMALD (H.) & HARRIS (R. V.). **Plant pathology, mycology, and bacteriology.**—*Rep. E. Malling Res. Sta., 1939*, pp. 28–30, 1940.

Apart from information already noted from other sources the following items may be mentioned in this report of research work carried out at East Malling. Strains of *Bacterium tumefaciens* [*R.A.M.*, xvii, p. 659] from various hosts, including raspberry, blackberry, and loganberry were found to differ in their ability to infect certain hosts. Promising results in control were obtained with an organic mercurial preparation [unspecified].

Experiments in the commercial control of raspberry mosaic [ibid., xix, p. 293] since 1927 indicated that maintaining supplies of clean cane from inspected and rogued nursery beds is not completely effective for varieties with a low symptom expression. The rapid testing of named and seedling varieties by direct infection and the use of indicator varieties is being attempted.

A comparison of the reactions of *Fragaria* spp. and commercial strawberry varieties to yellow edge [see next abstract] showed wide differences in susceptibility and symptom expression, ranging from high resistance and complete absence of symptoms in the parent species *F. chiloensis* to extreme susceptibility and continuous symptom expression in the other parent *F. virginiana* and the woodland strawberry *F. vesca*. These results show that the determination of the reaction of each named and seedling variety to the disease has become urgently necessary. By using *F. vesca* as an indicator, the clonal stock of Royal Sovereign strawberries raised at East Malling and rogued for yellow edge was confirmed to be free from this disease, but totally infected with mild crinkle [loc. cit.]. In 1938, samples of Royal Sovereign were obtained from a local stock in western Eire, where they had been introduced in 1905, and cultivated in almost unbroken isolation from other varieties. When grafted on to *F. vesca* most of these samples were completely free from yellow edge and crinkle, and in 1939 a pomological trial was begun to compare the performance of the mild crinkle-infected clones of Royal Sovereign with clones raised from the Irish strain.

HARRIS (R. V.) & KING (M. E.). **Review of research on Strawberry virus diseases, 1932–1939.**—*Rep. E. Malling Res. Sta., 1939*, pp. 66–68, 1940.

In this review it is stated that observations having shown that the symptoms of yellow edge [*R.A.M.*, xviii, p. 464; xix, p. 661] tend to be masked on the Royal Sovereign strawberry variety, a field experiment was started at East Malling in 1935 in which clonal series of plants were simultaneously infected by stolon-grafting each plant to an 'infector' from a clonal series of affected plants of the same variety. The symptom-intensity on a standard numerical scale was then recorded for individual plants of each series at weekly or fortnightly intervals up to 1939, fluctuations in symptom expression being examined in relation to environmental factors. Some time after the beginning of the experi-

ment, a Rogers' soil tensiometer was installed, and in 1939 striking correlations were noted between symptom-fluctuation and soil moisture. From such correlations it is now possible to predict the optimum time in a given season for the roguing of Royal Sovereign runner-beds.

Comparative transmissions by *Capitophorus fragariae* and grafting from strawberry plants with mild and severe crinkle [ibid., xviii, p. 326], respectively, to crinkle-free Royal Sovereign and *Fragaria vesca* plants gave results varying with the mode and source of infection, and demonstrated conclusively the etiologically distinct but closely related nature of the diseases. When transmission was effected by grafting, severe-crinkle plants always induced severe-crinkle symptoms, while mild-crinkle induced mild-crinkle; with aphid transmission, on the other hand, severe crinkle sometimes developed from mild sources, and vice-versa.

Report on the Department of Agriculture, St. Lucia, 1939.—38 pp., 1940.

In this report it is stated (on p. 26) that, during 1939, 556,538 banana stools were inspected in St. Lucia, of which 17,826 or 3·2 per cent. were found to be infected with Panama disease (*Fusarium* [*oxysporum*] *cubense*) [*R.A.M.*, xviii, p. 604]. In 1938 the corresponding figure was 2·86 per cent.

Condit (I. J.). **A bibliography on the Avocado (Persea americana Miller).**—293 pp., Riverside, Calif., Univ. Calif. Citrus Exp. Sta., 1940. [Mimeographed.]

The section relating to avocado diseases (pp. 115–131) in this bibliography contains 232 titles, covering the period from 1904 to 1939, inclusive.

Discussion on 'Efficiency with economy in the control of plant diseases and pests'.—*Ann. appl. Biol.*, xxvii, 3, pp. 433–440, 1940.

In opening this discussion at a meeting of the Association of Applied Biologists held in March, 1940, in London, H. Martin dwelt on the measures of controlling plant diseases under war conditions, concluding that chemical methods will be more extensively used than before. M. H. Moore contributed a paper on protective spraying against apple scab [*Venturia inaequalis*] dealing in particular with the correct timing of spray applications, the strengths of the sprays used, the methods of application, and the importance of adequate and balanced nutrition. C. Davis gave useful advice for the care of spraying machines and their accessories, and A. J. Wooldridge outlined an economical fruit spraying programme, successfully applied at his own farm for the last three years.

Montgomery (H. B. S.), Moore (M. H.), Shaw (H.), & Steer (W.). **Insecticides and fungicides.**—*Rep. E. Malling Res. Sta., 1939*, pp. 32–34, 1940.

Most of the information given in this review of the results obtained by the authors in their researches at East Malling during 1939 has already been noticed from other sources [*R.A.M.*, xviii, pp. 325, 461], but the following item may be mentioned. Experiments with the plum bacterial canker organism (*Pseudomonas mors-prunorum*) showed that it does not

survive outside the range P_H 2·8 to 9·6. Of 18 metals tested as nitrates mercury, silver, chromium, and copper were the most toxic, in the order given. Bordeaux mixture was no more toxic than a suspension of calcium hydroxide of similar alkalinity.

FINDLAY (W. P. K.). **Mould discoloration.**—*J. Oil Col. Chem. Ass.*, xxiii, 242, pp. 217–229, 1940.

Mould growths (chiefly species of *Aspergillus*, *Penicillium*, *Cladosporium*, and *Phoma pigmentivora*) on paint, though less troublesome in Great Britain, except under conditions of abnormally high atmospheric humidity, e.g., in breweries, laundries, and greenhouses, than in the Gulf States of America and the Panama Region [*R.A.M.*, xix, p. 613], are stated to be more serious on white than on coloured paints, not only because they are more obvious, but also for the reason that many coloured paints themselves contain fungicidal materials, or may be treated with the latter without impairment of appearance. Lead paints offer very little resistance to mould infection, but soluble zinc salts are highly fungicidal and zinc oxide moderately so. Lithopone is even more conducive to mould growth than white lead, and the same applies to titanium white, while antimony oxide is little or no better. Carbon black, blanc fixe, and other pigments with absorbed salts of potash or phosphorus are also reported to promote infection, which is greatly reduced, on the other hand, by the admixture of 2 per cent. zinc chrome with white lead paint. The tendency to mould development is further increased by linseed oil and the presence in the paint of 'foots' or traces of nitrogenous matter. In respect of resistance to fungal contamination, 'stored oils' are superior to raw or boiled, but in limited tests tung oil was found to be little or no better than linseed, while soy-bean was likewise ineffectual as a preservative. The more rapidly a paint dries the less likelihood there is of its becoming infected, since it is during the drying period that spores are liable to infect it. Enamels which dry with a smooth finish are less liable to infection than paints yielding a rough surface, offering easy lodgement for spores. The addition of hard resins increases resistance to infection. Nitrocellulose lacquers are by no means immune from attack, while bitumen and silicate compositions and aluminium paint are resistant.

No diffusion of nutriment from the substratum is necessary for fungal growth to occur on the paint film, but when the substratum is moist growth may be stimulated. The liability of underlying plaster to mould may affect the liability to mildew of any paint applied to it.

In warm, moist conditions the incorporation of some antiseptic in the paint is necessary to ensure a clean surface. The toxic constituent of most paints of this type for use in greenhouses and similar situations is a mercury salt, but such paints cannot be recommended for use in food factories and breweries, where trouble is often experienced.

In experiments on disks of mechanical wood pulp soaked in 2 per cent. malt solution, inoculated with *P. pigmentivora* and *Penicillium* sp., and incubated at 22° C., sodium pentachlorophenate (sold commercially as santobrite [ibid., xviii, p. 774; xix, p. 574]) gave almost perfect protection at the rate of 1 part per 100 of paint, while very satisfactory results were also obtained with mercuric chloride (1 in 500) and calomel

[mercurous chloride] (1 in 100, probably effective also at 1 in 500). A high degree of resistance was conferred by 5 per cent. zinc fluoride, zinc silicofluoride, zinc borate, and zinc benzoate. In limited tests under practical conditions on damp, mouldy door panels, paint containing 1 per cent. sodium pentachlorophenate and 5 per cent. sodium silicofluoride remained clean, whilst standard white lead paint showed considerable fungal growth.

The permanence of protection afforded the paint by the addition of antiseptics is an important consideration. In the United States the antiseptic in a concentrated form, mulled in oil, is marketed in a condition easy to mix with the paint; one firm of manufacturers has prepared mercurial and non-poisonous products for use out-of-doors and in domestic buildings or food factories, respectively.

Laboratory tests are only used to a limited degree to eliminate unpromising substances and it is necessary to carry out tests in selected localities. The author hopes to arrange for the exposure of test panels in the tropics, where climatic conditions are more suitable for tests than in England.

In treating painted surfaces against mould the discoloured paint should be either stripped or thoroughly washed with an alkaline cleaning soap solution containing trisodium phosphate or sodium metaphosphate at the rate of 1 lb. per gal. After drying, the infected areas should be brushed over with an antiseptic solution, e.g., mercuric chloride (1 in 500) or the non-poisonous thymol (1 in 200). A highly pigmented paint containing hard-drying pigments, especially zinc oxide, should be used where mould has been experienced. The use of less oil and more turpentine is recommended for paste paints.

PARTANSKY (A. M.) & MCPHERSON (R. R.). **Testing mold-resistant properties of oil paints.**—*Industr. Engng Chem.*, Analyt. Ed., xii, 8, pp. 443–445, 4 figs., 1940.

Particulars are given of a rapid, dependable, and convenient method of testing the mould-resistant properties of oil paints now in use at the Biochemical Research Laboratory, Dow Chemical Co., Midland, Michigan. Disks of western white pine [*Pinus monticola*], 3 in. in diameter and 0·25 in. thick, are extracted prior to the application of the paint with a high-solvency naphtha. After the lapse of at least five days since the application of the second coat of paint, the disks are soaked overnight in distilled water, seeded with the test fungus, a rapidly growing *Aspergillus*, and incubated in moist Petri dishes, generally for three weeks. For recording mould growth a binomial system with 10 as the maximum value for each reading is used, the first number of the pair indicating extent and the second intensity of growth.

LUDWIG (W.). **Schimmelpilz-Bildung auf Anstrichen.** [Mould growth on painted surfaces.]—*Farbe u. Lack, 1939*, 42, p. 469; 43, p. 475; 44, p. 481, 1939.

Recommendations are made for the protection of painted surfaces from attack by moulds [see preceding abstracts], among which *Aspergillus niger* and *Penicillium glaucum* are stated to predominate in Germany: these include the application of aqueous alkaline vehicles, such

as lime or sodium silicate; the addition of 20 to 30 per cent. of a low-η stand oil to linseed oil paints to reduce their water absorption; the incorporation of a hard oil-reactive phenolic or alkyd resin; the use of chlorinated rubber, benzylcellulose, and bitumen in oil-free compositions; the admixture of zinc oxide with oil paints to harden the film; and (where fungal damage is particularly to be feared) the inclusion of a fungicide, e.g., among inorganic compounds 1 to 3 per cent. copper oxide or copper sulphate, 0·1 to 0·5 per cent. mercuric chloride, and of organic disinfectants, thymol, chlorisothymol, chlorometacresol, chloronaphthalene, phenol, and phenyl mercury acetate.

Chilton (S. J. P.). **A simple single-spore isolator.**—*Phytopathology*, xxx, 8, pp. 695–697, 1 fig., 1 diag., 1940.

An attachment [which is described] has been devised for clamping on to the holder of the substage condenser to make monospore isolations [*R.A.M.*, xii, p. 579; xviii, p. 334]. Satisfactory isolations have been effected with single spores only 7 μ in length.

Marchionatto (J. B.). **Las malezas y las enfermedades de las plantas cultivadas.** [Weeds and diseases of cultivated plants.]—*Agronomía, B. Aires*, xxxii, 157, pp. 26–36, 1940.

In view of the recognized importance of weeds as alternate hosts of diseases of economic crops [*R.A.M.*, ii, p. 563; ix, p. 390], a list is given of the fungi attacking some widely distributed representatives of this group of plants in the Argentine.

Bond (T. E. T.). **Observations on the disease of Sea Lyme-Grass (Elymus arenarius L.) caused by Ustilago hypodytes (Schlecht.) Fries.**—*Ann. appl. Biol.*, xxvii, 3, pp. 330–337, 2 pl., 1 fig., 2 diags., 1940.

Plants of *Elymus arenarius*, widely used for the prevention of coastal erosion, were observed in the neighbourhood of Aberdeen suffering from the disease caused by *Ustilago hypodytes* [*R.A.M.*, xv, p. 511]. The diseased shoots vary in their size, being in some cases smaller and in others taller than healthy ones. The diseased flowering stems remain sterile, producing leafy shoots in place of inflorescences. The vegetative region of the stem bears normal leaves and a normal number of internodes, but measures only one half the length of corresponding region of a healthy stem. The inflorescence region bears appendages resembling leaf sheaths without blades and has fewer internodes than the normal ear, but is much elongated. The fungus chiefly sporulates in the inflorescence. Occasionally, diseased stems may produce normal spikelets capable of forming grain. Near Aberdeen the fungus was also found on *Agropyron acutum*. An examination of excavated infected plants showed that the presence of the fungus favours vegetative elongation of the rhizomes at a time when this activity would otherwise be reduced. Mycelium was present in every node and associated resting bud of the rhizome as well as in the apices of all shoots and runners. In the mature stem it occurs chiefly in the outer cortical region but is also present in the parenchymatous tissue of the nodes and at the base of the leaf sheaths. In nature the disease is commonly spread by the vegetative multiplication of affected plants. A certain amount of

indirect evidence also points to the possibility of seedling infection by spores. All attempts to germinate the spores of the fungus in the laboratory failed and the results of inoculation experiments were inconclusive.

SADASIVAN (T. S.). **A quantitative study of the interaction of viruses in plants.**—*Ann. appl. Biol.*, xxvii, 3, pp. 359–367, 1 pl., 1 graph, 1940.

In protective inoculation experiments conducted at Rothamsted, two pairs of related viruses were used. Tobacco and *Nicotiana glutinosa* plants inoculated with tobacco mosaic virus or potato virus X^G (which cause systemic mottling symptoms in these plants) acquired immunity from tomato aucuba mosaic or potato virus X^S (which cause necrotic local lesions in the test plants). When the tips of tobacco leaves were inoculated with either tobacco mosaic or X^G virus and reinoculated with tomato aucuba mosaic or potato virus X^S after an increasing interval, the results showed that the X^G inoculated areas were quite immune from X^S after 12 days and the tobacco mosaic virus areas immune from aucuba mosaic virus after 4 days. The bases of such leaves showed incomplete inhibition even after 20 and 24 days. When the bases of the leaves were inoculated the results were essentially the same but the leaf tips acquired resistance much more slowly and incompletely.

When X^S or aucuba mosaic viruses were mixed *in vitro* with healthy plant sap or sap containing an unrelated virus, the infectivity of these viruses was reduced, but this inhibitory effect was much greater when they were mixed with their related strains.

It is concluded that in the plant tissue there is an intense competition between related viruses, and evidence was obtained that the degree of resistance to one is directly proportional to the amount of the other present.

ROBERTS (F. M.). **Studies on the feeding methods and penetration rates of Myzus persicae Sulz., Myzus circumflexus Buckt., and Macrosiphum gei Koch.**—*Ann. appl. Biol.*, xxvii, 3, pp. 348–358, 2 pl., 1940.

In further experiments on the methods of transmission of three strains of *Hyoscyamus* virus III, potato virus Y, and cucumber virus 1 by the aphids *Myzus persicae*, *M. circumflexus*, and *Macrosiphum gei* [*R.A.M.*, xix, p. 230], previously starved and non-starved insects were fixed on White Burley tobacco or Kleinwanzleben E sugar beet plants after feeding periods ranging from 5 minutes to 24 hours. The average depth of tobacco plant tissue penetrated by both starved and non-starved *Myzus persicae* after five minutes was 49 μ and that by *M. circumflexus* 57 μ, none of the aphids having reached the phloem. After one hour's feeding, 5 out of 9 *M. persicae* and all the six *M. circumflexus* examined were feeding in the phloem, and after 24 hours' feeding 6 out of 10 of the latter. Compared with these two species, *Macrosiphum gei* on tobacco showed a higher percentage of insects feeding in the phloem tissue. The mode of penetration was chiefly intracellular with *Myzus persicae* (59 per cent.) and consistently so with *Macrosiphum gei* (100 per cent.), but it was mostly intercellular with *Myzus circumflexus* (64

per cent. intercellular, 13 per cent. intracellular, and 23 per cent. doubtful).

In experiments with sugar beet, only 2 out of 18 *M. persicae* succeeded in penetrating the phloem after 15 minutes' feeding, and only 50 per cent. after two hours. The feeding habit of this aphid on sugar beet was very similar to that on tobacco, well over 50 per cent. of the penetrations being intracellular. In no case during these studies has a toxic reaction of the host plant to an insect's saliva been observed.

It is concluded from the results of these experiments that the efficiency of the vectors tested does not depend on localization of the viruses in the vascular tissue of the host plant and, in general, does not appear to be associated with any particular tissue tapped during feeding or with any special method of penetration. The only possible exception might be cucumber virus 1, in which case localization of the virus may account for the difference in behaviour between *M. persicae* and *M. circumflexus* in transmitting it, the latter aphid showing typical decrease in infectivity between 5 and 15 minutes' feeding, while the former shows no such decrease and sometimes does not reach maximum efficiency until 15 minutes. This difference may be explained by the fact that at the time of optimum infectivity for *M. persicae* (less than 5 minutes) the insect has not reached the tissues where the virus is most highly concentrated, whereas it seems that *M. circumflexus* penetrates more deeply than *M. persicae* during five minutes' feeding.

In experiments on the transmission of sugar beet yellows virus by *M. persicae*, the efficiency of the vector increased with increasing feeding time on both infected and healthy plants. The number of aphids penetrating to the phloem also increased with increasing feeding time, i.e., the percentage after 15 minutes, 2 hours, and 24 hours being 11, 50, and 77, respectively. Evidence was obtained suggesting that the beet yellows virus must be obtained from and inoculated into the phloem.

STEINBERG (R. A.) & THOM (C.). **Mutations and reversions in reproductivity of Aspergilli with nitrite, colchicine and *d*-lysine.**—*Proc. nat. Acad. Sci., Wash.*, xxvi, 6, pp. 363–366, 1940.

The reason for previous failures to induce fungal mutation by means of colchicin is believed to lie in the use of acid solutions, which hydrolyse the effective principle into the virtually inactive colchicein. The destruction of the alkaloid may be prevented, however, by the addition of excess calcium carbonate to the solution, mutants approximating in type to those secured with nitrite [*R.A.M.*, xix, p. 424], but yielding more intermediate forms, having been easily obtained in recent experiments with *Aspergillus fumigatus*, *A. nidulans*, *A. flavus*, *A. fischeri*, *A. variecolor*, and *A. alliaceus*. Partial reversion of mutation in *A. amstelodami* has also been effected with the aid of colchicin.

The changes in inheritance experimentally induced in the eight species of *Aspergillus* investigated by the authors [loc. cit.] are departures from the normal inheritance of these species, the stability of which in some cases has persisted for more than 20 years. These artificially induced strains could be duplicated from forms obtained from natural sources. When produced at all by the mutants, conidia and ascospores conform entirely to those of the original strains. The action of nitrite results in

the production of mutants injured to a varying degree in their ability to differentiate and therefore to reproduce. Other reagents destructive of the amino group in amino acids and proteins exercise a similar effect. The use of high concentrations of *d*-lysine, the amino acid presumably affected by nitrite, resulted in reversion of mutation in *A. niger*, and to some extent in *A. amstelodami*. Chemical conditions conducive to the re-introduction of amino groups also bring about a reverse mutation, but the precise nature of the underlying process is by no means clear.

WHITE (E. C.). **Bactericidal filtrates from a mold culture.**—*Science*, N.S., xcii, 2380, p. 127, 1940.

At the Brady Institute, Johns Hopkins Hospital, a mould tentatively identified by C. Thom as *Aspergillus flavus* has been found to grow readily in liquid media, yielding filtrates with a definitely bactericidal action on certain Gram-positive and Gram-negative organisms. Another strain of *A. flavus* was found to be totally inactive in this respect, whereas several members of the *oryzae-flavus* group and a strain of *A. parasiticus* were more or less toxic to the bacteria tested. The results with any mould are essentially dependent on the medium used.

LEONIAN (L. S.) & LILLY (V. G.). **Auxithals synthesized by some filamentous fungi.**—*Plant Physiol.*, xv, 3, pp. 515–525, 1940.

Of the six fungi tested at the West Virginia University for their capacity to synthesize biotin, thiamin, and the two moieties (pyrimidin and thiazole) of thiamin [cf. *R.A.M.*, xix, p. 649], *Fusarium niveum* was found to be able to synthesize biotin and thiamin from pure dextrose, amino acids, and inorganic salts, while *Phytophthora erythroseptica* can synthesize biotin but requires a supply of thiamin from an external source. The bulk of thiamin is stored in the mycelium, and only traces of this substance find their way into the medium; appreciable amounts of pyrimidin and thiazole, however, diffuse into the substratum. Biotin also resides largely in the mycelium, but it passes into the medium in larger quantities than thiamin.

Scottish Society for Research in Plant Breeding. Report by the Director of Research to the Annual General Meeting, 18th July, 1940.—32 pp., 1940.

The following items of interest occur in this report [cf. *R.A.M.*, xviii, p. 408]. W. Black states that in breeding potatoes for resistance to *Phytophthora infestans* [ibid., xix, p. 300] the proportion of resistant plants in the different seedling progenies, mostly derived from the highly resistant *Solanum demissum* back-crossed to a cultivated variety, ranged from $33\frac{1}{3}$ to more than 80 per cent. The mode of inheritance of resistance seems to be complex, but no difficulty was encountered in retaining resistance in combination with other desirable qualities. Progenies resulting from crosses between the resistant seedling 967c (38), a sixth-generation derivative of *S. demissum* and *S. edinense*, and cultivated varieties contained about 45 per cent. resistant types. In inter-crossing commercial types attention was given to those immune in the field from potato viruses A and X.

The new variety, Craig's Defiance, was multiplied at Ainville in 1939,

and a stock seed certificate was granted by the Department of Agriculture in respect of the crop.

In the section dealing with virus disease research (by G. Cockerham and C. H. Cadman) it is stated that the evidence obtained strongly suggested that necrotic reactions to viruses A, B, and C are determined by different 'necrotic' genes, all dominant over their 'non-necrotic' allelomorphs. There also appeared to be linkage relationships between some of the 'necrotic' genes. Viruses B and C were ascertained to be common causes of mosaic in certain varieties in the field.

In field trials the incidence of infection by the Y and leaf roll viruses in 1938 was higher than on any previous occasion, and this was associated with the earlier appearance of aphids than in previous years and the exceptionally high populations present in July and August [both virus Y and leaf roll being transmissible by aphids].

BLACK (L. M.). **Strains of Potato yellow-dwarf virus.**—*Amer. J. Bot.*, xxvii, 6, pp. 386–392, 4 figs., 1940.

In this paper the author describes further studies on the virus of potato yellow dwarf (*Marmor vastans* H.) [*R.A.M.*, xviii, p. 270; xix, p. 39]. Of the seven strains used, B_1 and B_2 were obtained from a *Nicotiana glutinosa* plant inoculated by means of *Aceratagallia sanguinolenta*, B_3 and B_7 by passing the field strain through Turkish tobacco and Large Rooted chicory, respectively, B_4 and B_5 from local lesions on *N. rustica* leaves inoculated with the field strain, and B_6 from a single individual of *A. sanguinolenta* which transmitted a necrotic type variant of the virus to *Trifolium incarnatum*. B_4 was similar to, if not identical with, the field strain.

On *N. rustica* the symptoms set up were as follows. B_1 produced light green, diffuse local lesions, the systemically invaded leaves slowly turning yellow. B_2 gave similar, but milder, symptoms. B_3 caused small, yellowish lesions with a definite outline, the systemically invaded leaves turning yellow at the tip and showing vein-clearing and yellow or brownish spotting over the remainder of the surface. B_4 gave rise to large, diffuse, yellow lesions, the systemically invaded leaves yellowing uniformly. B_5 produced brown lesions with necrotic, grey centres, and caused rapid leaf-yellowing, extensive vein necrosis, large, necrotic areas, and the death of the whole leaf, the plant itself sometimes succumbing. B_6, which was eventually lost, produced brown, necrotic lesions much smaller than those due to B_5. Systemic symptoms set up by B_6 were delayed, and extensive vein necrosis rapidly developed, apparently preceded by vein enlargement, the dead veins forming a raised reticulation; this was followed by large, necrotic blotches and the death of the entire leaf. When systemically invaded before maturity, the plant died. B_7 formed small, light yellow lesions with irregular margins; systemic symptoms were delayed, and took the form of intense leaf yellowing. On Green Mountain potatoes all the strains caused a rather severe disease, though some set up milder symptoms than others.

Cross-inoculation studies demonstrated that *N. rustica* plants previously invaded with B_1, B_2, B_3, or B_4 were protected against systemic invasion by B_5, and could not be distinguished in this respect from the

controls. When B_5 was inoculated into *N. rustica* plants previously invaded by potato ring spot (*M. dubium* H. var. *annulus* H.), potato veinbanding (*M. cucumeris* H. var. *upsilon*), cucumber mosaic (*M. cucumeris* H. var. *vulgare* H.), lucerne mosaic (*M. medicaginis* H. var. *typicum* Black & Price), B_2, or B_7, advanced systemic symptoms of B_5 developed on all the plants except those previously invaded by B_2 and B_7.

Of the seven strains described, only B_4 and B_5 appear at present (by reason of their usefulness and probable permanence) to merit varietal names, and are, accordingly, named *M. vastans* H. var. *vulgare* n. var., and *M. vastans* H. var. *lethale* n. var., respectively.

GÜSSOW (H. T.) & RACICOT (H. N.). **Bacterial ring rot. A serious menace to the Potato industry.**—1 p., 1 col. pl., Ottawa, Sci. Serv., Agric. Suppl. Bd, Dom. Dep. Agric., 1940.

This poster giving directions for the prompt recognition in the field in Canada of bacterial ring rot of potatoes (*Bacterium sepedonicum*) [*R.A.M.*, xix, p. 428] is noteworthy for the attractive coloured plate illustrating the early and late symptoms of the disease.

METZGER (C. H.) & BINKLEY (A. M.). **Some evidence on the spread of bacterial wilt.**—*Amer. Potato J.*, xvii, 8, pp. 198–201, 1940.

Evidence is presented in tabular form showing that at the Colorado State College a larger number of potato plants down the row (i.e., the direction in which irrigation water travels) from a plant showing symptoms of bacterial wilt [*Bacterium sepedonicum*: *R.A.M.*, xix, p. 360] contracted infection than those up the row. A total of 200 out of a possible 480 plants (41·7 per cent.) in two fields surrounding wilted plants became diseased. The seed stock used in this experiment must have contained a trace of wilt in 1938, which increased to 2·5 per cent. external infection in 1939, involving on the basis of the data obtained at harvesting a minimum of 18 per cent. diseased tubers. The substantial amount of upward spread along the row and across two rows, in addition to the downward course of infection, can hardly be accounted for by irrigation water alone and the implication of the locally prevalent flea-beetle [*Epitrix cucumeris*] is suspected.

SCHAAL (L. A.). **Variations in the tolerance of certain physiologic races of Actinomyces scabies to hydrogen-ion concentration.**—*Phytopathology*, xxx, 8, pp. 699–700, 1 fig., 1940.

Two strains of *Actinomyces scabies*, designated Nos. 23 and 66, were isolated from potatoes growing in soils of P_H 6·8 and 5·4, respectively, in Minnesota. Neither made any growth on potato dextrose agar at P_H 4·5, No. 66 developed freely at a range of P_H 5 to 8·5, while No. 23 only grew sparsely at 5·5 but equalled No. 66 at P_H 6 to 8·5. In comparative tests with seven isolates from the United States and one from Australia, No. 66 was the only one to grow readily at P_H 5 on the medium selected.

In inoculation experiments on Green Mountain and Katahdin tubers, No. 66 produced shallow, blister-like pustules, whereas No. 23 caused the formation of deep, severe-type pustules [*R.A.M.*, xix, p. 111] on

the same varieties in soil with a reaction of P_H 6·8. The degree of pathogenicity of No. 66 in soil with a hydrogen-ion concentration of P_H 6·8 was practically the same as 5·4, the reaction of its site of origin, so that in this case soil reaction does not appear to have been a factor in the determination of pustule type. Generally speaking, field reactions below P_H 5·4 are exclusively associated with the shallow type of scab.

The results of these experiments are considered to point to the existence of physiologic specialization in *A. scabies* [ibid., xvii, p. 412].

HAYASHI (T.). **Biochemical studies on 'bakanae' fungus of the Rice. Part V. Effect of gibberellin on growth, fermentation and size of yeast cell. Part VI. Effect of gibberellin on the activity of amylase in germinated cereal grains.**—*J. agric. chem. Soc. Japan*, xvi, 5, pp. 386–388; 6, pp. 531–538, 4 graphs, 1940. [Japanese, with English summaries on pp. 84, 103.]

Gibberellin, the active principle of the 'bakanae' (elongating) fungus of rice [*Gibberella fujikuroi*: *R.A.M.*, xix, p. 363], was found in the writer's experiments at the Imperial Agricultural Station, Hongo, Tokyo, to be without effect on the growth, fermentation, or size of yeast (*Saccharomyces cerevisiae* and *S. pombe*) cells. On the other hand, it stimulated the germination of hulled and naked barley, wheat, and rice grains and the amylase activity of those of germinated barley and wheat.

[Part IV of this series of investigations, entitled 'The cultural conditions for producing gibberellin or fusaric acid' by T. YABUTA, Y. SUMIKI, & S. UNO appears (in Japanese only) in the same journal, xv, 12, pp. 1209–1220, 1940.]

HEUBEL (G. A.). **Tapvlakziekten en tapvlakziektenbehandeling van Hevea brasiliensis. II.** [Tapping surface diseases of *Hevea brasiliensis* and their control. II.]—*Bergcultures*, xiv, 32, pp. 1005–1014; 33, pp. 1036–1045, 1940.

This is a useful summary of the knowledge at present available concerning the diseases of the tapping surface of *Hevea* rubber and their control in the Dutch East Indies. Reference to most of the investigations on which the information is based has been made at frequent intervals in this *Review*. A special feature of this contribution is a table showing the water content, boiling point, emulsibility, and retail price as at 31st May, 1940, of some brands of carbolineum now on the market.

GORDON-DUFF (D. C.). **Oidium in relation to replanting in mid-country.** —*Quart. Circ. Ceylon Rubb. Res. Scheme*, xvii, 2, pp. 131–141, 1940.

In discussing the effect of *Oidium* [*heveae*] on the planting of *Hevea* rubber in Ceylon the author expresses the view that the disease should not deter anyone from replanting old rubber in mid-country zones (from elevations of 800 to 1,500 ft.). The fungus is thought not to hibernate [but see *R.A.M.*, x, p. 270] and no resting stage is known. Instances of dissemination of spores by wind are cited and windbreaks are said to reduce the spread of infection. The use of fertilizers is considered to induce a more rapid recovery of the trees from the effects of infection.

In dusting, the author obtained good results with beacon curative and preventive sulphur mixed (1 : 3) with a sulphur powder of high sulphur content; the former product is very low in sulphur, but contains a considerable amount of mud, which acts as a sticker. The author considers that dusting gives the best results when frequent small applications are made. With a carrying machine one supervisor and eight labourers can dust about 100 acres in a day, whereas using mechanical transport in an area with good roads 500 acres can easily be treated by one supervisor, one driver, and one labourer in four hours. In a badly infected area the cost of sulphur control in the first two years amounts to not more than 1 to 1·2 rupees [1*s.* 6*d.* to 1*s.* 9½*d.*] per acre per year. In old, badly infected rubber, the maximum cost was 4·53 rupees [6*s.* 9½*d.*].

SCHUSTER (R. E.) & STEPHENSON (R. E.). **Sunflower as an indicator plant of boron deficiency in soils.**—*J. Amer. Soc. Agron.*, xxxii, 8, pp. 607–621, 3 figs., 1 graph, 1940.

Sunflowers grown on various soils deficient in boron at the Oregon Agricultural Experiment Station developed foliar abnormalities, the terminal buds ceased growth, and dry weight was reduced. The affected plants also suffered severely from mildew [*Erysiphe cichoracearum*] during August and September, 1936 and 1937, while those given boron showed little or no infection. Humus depletion appeared to aggravate boron deficiency, which was corrected by the admixture of appropriate quantities of compost.

Available boron is usually most plentiful in the upper 3 ft. of soil, the shortage below this depth frequently being extreme, especially in eroded soils, such as the Melbourne series derived from sandstone.

PIPER (C. S.). **The symptoms and diagnosis of minor-element deficiencies in agricultural and horticultural crops. Pt. II. Copper, zinc, molybdenum.**—*Emp. J. exp. Agric.*, viii, 31, pp. 199–206, 1 pl., 1940.

Most of the work referred to in the author's summary of the symptomatology and diagnostic features of deficiency diseases of crops [cf. *R.A.M.*, xix, p. 486] associated with the lack of available copper and zinc in the soil has been noticed from time to time in this *Review*. Molybdenum has only recently been added to the list of elements essential for growth, and so far no naturally occurring disease has been attributed to its absence, but the writer has ascertained the need for traces (0·02 mg. per l.) of the mineral in the nutrient solutions of oats to prevent the development on the upper leaves, at an advanced stage of maturity, of pale reddish-brown or rust-coloured lesions, followed by the death of the plants, which produced only shrivelled grain. Similar results were obtained by Arnon (*Soil Sci.*, xliv, pp. 91–121, 1937) in experiments on barley and (in collaboration with Stout) on tomato, the latter when deprived of molybdenum showing a characteristic mottling, necrosis of the leaf margins, and involution of the laminae.

JACKS (G. V.) & SCHERBATOFF (Miss H.). **The minor elements of the soil.**—*Tech. Commun. Bur. Soil Sci., Harpenden*, 39, 86 pp., 1940.

Most of the sections in this revision of a previous publication by the same authors entitled 'Soil deficiencies and plant diseases' [*R.A.M.*,

xiv, p. 469] have been entirely rewritten, with more stress on the distribution and reaction of the minor elements (to which cobalt, selenium, iodine, molybdenum, chromium, and thallium have been added) in the soil, and relatively less on the physiological aspects of the crop disorders associated with their absence. A few instances are also cited of toxicity due to the presence of injurious quantities of minor elements. Some outstanding contributions to the available information on each of the elements are briefly summarized and a bibliography is appended to all the sections.

VIMUKTANANDANA (Y. Y.) & CELINO (M. S.). **Anthracnose of Black Pepper (Piper nigrum Linn.).**—*Philipp. Agric.*, xxix, 2, pp. 124–141, 4 figs., 1 graph, 1940.

A full description is given of anthracnose of black pepper (*Piper nigrum*) in the Philippines, caused by the imperfect stage of *Glomerella cingulata*, the conidial dimensions of which (12·2 to 19·2 by 3·5 to 7·0 μ on the host and 10 to 28 by 3·5 to 7 μ in culture) approximate closely to those of the same organism on avocado and mango [*R.A.M.*, xix, p. 663]. Under the humid climatic conditions prevailing in the Los Baños district, the dark grey, yellow-bordered, later nearly black, progressively expanding necrotic lesions may seriously interrupt the normal functions of the leaves on which they develop and cause a substantial depletion in the yield. The disease frequently starts at the tip of the leaf and from thence invades $\frac{1}{3}$ to $\frac{1}{2}$ of the lamina, seriously infected leaves falling prematurely and the plant sometimes being killed. The spores of the fungus may be disseminated by wind, rain, or water traversing the infected areas of the foliage, while the mycelium persists in a dormant state in the diseased tissues during dry weather. The fungus was shown by inoculation experiments to be weakly parasitic on black pepper and only attacked slowly growing, weakened plants. Control measures should include the collection and burning of infected leaves, cultural methods designed to produce vigorous growth and enhance resistance, and partial shading of the vines during the intense heat of summer.

WIEHE (P. O.). **La maladie de la racine sur la P.O.J. 2878.** [Root disease on P.O.J. 2878.]—*Rev. agric. Maurice*, xix, 1, pp. 8–11, 1 fig., 1940.

Examination of the roots of P.O.J. 2878 sugar-canes growing in the Savanne, Grand Port, Flacq, and Moka districts of Mauritius, apparently under favourable soil and climatic conditions, but affected with root disease [*R.A.M.*, iv, p. 569; vi, p. 16], showed the presence of *Heterodera marioni* and (invariably) of *Anguillulina similis*, to which the disease is ascribed. Invasion by these nematodes opens the way for infection by weak parasites, species of *Rhizoctonia*, *Pythium* [cf. ibid., xiii, p. 494], *Fusarium*, and *Penicillium* being frequently isolated. *Pythium arrhenomanes* was found in the rotted roots on several occasions, but in no instance appeared responsible for decline of the whole plant. As a result of root rot the area planted to the variety D/130 [cf. ibid., ix, p. 341] in the northern part of the island has declined from 18 per cent. of the total cane area (in this district) in 1915 to 0·5 per cent. in 1938.

Orian (G.). **Notes préliminaires sur quelques hôtes artificiels du Bacterium albilineans Ashby.** [Preliminary notes on some artificial hosts of *Bacterium albilineans* Ashby.]—*Rev. agric. Maurice,* xix, 1, pp. 12–13, 1940.

Bacterium albilineans, isolated from sugar-cane affected with leaf scald and inoculated into the same host for identification purposes, was then successfully inoculated into maize, *Coix lacryma-jobi, Thysanolaena agrostis, Cymbopogon citratus, Paspalum scrobiculatum* var. *commersonii, P. dilatatum, P. paniculatum, Sorghum halepense, Panicum maximum, Pennisetum purpureum,* and bamboo (*Bambusa vulgaris*), all these plants developing characteristic symptoms in five or six days, the organism then being re-isolated and again inoculated into sugar-cane, with the resultant development of leaf scald symptoms in every case. As *Bact. albilineans* does not appear able to infect these hosts in nature, they do not constitute any source of danger to sugar-cane.

Abbott (E. V.). **A progress report on the study of chlorotic streak of Sugarcane in Louisiana.**—*Sug. Bull., N.O.,* xviii, 19, pp. 3–6, 1940. [Abs. in *Plant Breed. Abstr.,* x, 4, p. 294, 1940.]

Chlorotic streak of sugar-cane is stated to be spreading in Louisiana [*R.A.M.,* xviii, p. 203], where most varieties are affected, C.P. 29/320 being particularly susceptible. Co. 281 and 290 have so far proved resistant to the disease.

Cooke (W. B.). **A nomenclatorial survey of the genera of pore fungi.**—*Lloydia,* iii, 2, pp. 81–104, 1940.

Following a discussion of the nomenclature of the Polyporaceae a critical analysis of the proposed *nomina conservanda,* in so far as they relate to the Polyporaceae, of the 1935 edition of the International Rules of Botanical Nomenclature is presented [cf. *R.A.M.,* xviii, p. 755], and lists are given of (*a*) 88 recognized genera (with selected types and a key) and (*b*) 131 excluded genera, including *nomina nuda,* homonyms, and synonyms. The bibliography is arranged in chronological order from 1821 to 1939, and the paper terminates with an alphabetical index to the genera.

Hiratsuka (N.). **Materials for a rust-flora of Kiushu.**—*Trans. Sapporo nat. Hist. Soc.,* xvi, 3, pp. 139–146, 1940.

This annotated list of 52 rusts from Kiushu Island, Japan, includes [with Latin diagnoses] two new species, *Milesina chikugoensis* Hiratsuka on *Cyrtomium fortunei* J. Sm. (*Polystichum fortunei* Nakai) and *M. miikensis* Hiratsuka on *Phymatopsis hastata* Kitagawa (*Polypodium hastatum* Thunb.). In neither case was the teleuto stage observed, the fungi being placed in the genus to which they are ascribed because of the characters of the uredo stage.

Săvulescu (T.). **Contribution nouvelle à la connaissance des Urédinées de Roumanie.** [A new contribution to the knowledge of the Uredineae of Rumania.]—*Bull. Sect. Sci. Acad. roum.,* xxii, 2, pp. 1–18, 5 figs., 1939.

This annotated list of Rumanian Uredineae [*R.A.M.,* xvii, p. 556] contains three new species [with Latin diagnoses], including *Puccinia*

callistephi on *Callistephus chinensis*, 16 species not previously recorded for Rumania, and three of rare occurrence in the country. *P. callistephi*, the spots formed by which, when apparent at all on living leaves of *C. chinensis*, are sparse, minute, yellowish or pale chestnut, is characterized by globose, ovoid or ellipsoid yellow to brown, echinulate uredospores, 19 to 28 by 17 to 25 (average 22 to 24 by 18 to 21) μ, and ellipsoid, ovate-ellipsoid, or oblong-ellipsoid, smooth, chestnut teleutospores, 33 to 42 by 19 to 25 (average 36 to 39 by 21 to 24) μ, with a hyaline, persistent pedicel, 30 to 78 by 5 to 9 (45 to 66 by 6 to 8) μ.

HULEA (A.). **Contributions à la connaissance des champignons commensaux des Urédinées.** [Contributions to the knowledge of fungi commensal with the Uredineae.]—*Bull. Sect. Sci. Acad. roum.*, xxii, 4, pp. 1–19, 20 figs., 1939.

Following a general survey of the morphological and biological characters of the group of fungi commonly regarded as parasites of rusts, but believed by the author to be in general merely commensal with these pathogens, a description is given of twelve species occurring in Rumania, including four new ones [with Latin diagnoses], viz., *Darluca filum* [*R.A.M.*, xviii, p. 778] on the uredospores of *Puccinia menthae* on *Mentha longifolia* leaves; *D. iridis* on the uredo- and teleutospores of *P. iridis* on *Iris güldenstaedtiana*; *D. genistalis* var. *hypocreoides* on *Melampsora galanthi-fragilis* on the foliage of *Salix fragilis*, and var. *stromatica* on the uredospores of *P. graminis* on *Agrostis alba*; *Phyllosticta aecidiicola* n.sp., with black, globose pycnidia furnished with an erumpent, brown to fuliginous ostiole, and hyaline, straight or slightly curved spores, 5 to 6 by 2 to 3 (average 5 to 2·5) μ, in company with *Uromyces limonii* on living leaves of *Statice gmelini*; *Ramularia uredinearum* n.sp., characterized by densely fasciculate, hyaline, continuous, flexuous, often subgeniculate conidiophores, 15 to 40 by 2·5 to 3 μ, and cylindrical to ellipsoid, continuous or uniseptate conidia, 9 to 24 by 3 to 4·5 (11 to 18 by 3·5 to 4) μ occupying living leaves of *Cerinthe minor* in association with *Aecidium asperifolium*; *Penicillium uredineicolum*, with conidiophores 3 to 4 μ in diameter, primary and secondary sterigmata, 6 to 12 by 3 to 3·5 and 5·5 to 10 by 2 to 3·5 μ, and concatenate, fasciculate, globose, smooth conidia, 3 to 4 (3·5 to 3·8) μ, on the aecidia of *Puccinia soldanellae* on *Soldanella montana* and of *Melampsora hypericorum* on the leaves of *Hypericum montanum*; *Cladosporium aecidiicolum* on *P. coronata* on *Rhamnus frangula* leaves, *P. circaeae* (teleutospores) on *Circaea lutetiana* foliage, and *P. violae* (aecidia) on *Viola silvatica* leaves and petioles; *Macrosporium uredinis* on the aecidia of *P. violae* on *V. silvatica* and the uredo- and teleutospores of *P. antirrhini* on *Antirrhinum majus*; *Gonabotrys flava*, parasitic on *M. uredinis*; *Colletotrichum uredinophilum* n.sp., with numerous multiseptate, simple, olivaceous to black setae (subhyaline at the apex), 65 to 135 by 4 to 7 (70 to 100 by 4 to 5) μ, hyaline, filiform conidiophores, 18 to 36 by 2·5 to 2·8 (21 to 20 by 2·5) μ, and acrogenous, hyaline, arcuate conidia, 15 to 24 by 2·8 to 3 (18 to 24 by 3) μ, in company with *Aecidium muscaridis* on living leaves of *Muscari botryoides*; *Tuberculina persicina* [ibid., xix, p. 433] on the aecidia of *A. euphorbiae* on *Euphorbia agraria* leaves; and *T. vinosa* on the aecidia of *P. poarum* on *Tussilago farfara* foliage.

Săvulescu (T.). **Péronosporacées, Ustilaginacées et Urédinées nouvelles pour la mycoflore de Roumanie.** [Peronosporaceae, Ustilaginaceae, and Uredineae new for the mycoflora of Rumania.]—*Bull. Sect. sci. Acad. roum.*, xxii, 5, pp. 7–12, 4 pl., 3 figs., 1 graph, 1940.

The present critically annotated list of species new to Rumania [*R.A.M.*, xiv, p. 471; xv, p. 829] includes *Ustilago bromivora* [ibid., xvii, pp. 45, 505] on *Bromus tectorum*, and three fungi new to science.

Christensen (J. J.) & Rodenhiser (H. A.). **Physiologic specialization and genetics of the smut fungi.**—*Bot. Rev.*, vi, 8, pp. 389–425, 1940.

This comprehensive survey, supplemented by a bibliography of 132 titles, covers numerous aspects of the complex problems involved in the physiologic specialization and genetics of the smuts. Most of the contributions to which reference is made were noticed in this *Review* as they appeared.

Arwidsson (T.). **A short note on parasitic fungi from the Azores.**—*Bot. Notiser*, *1940*, 2, pp. 237–239, 1940.

This is a critically annotated list of 11 parasitic fungi collected by H. Persson in the Azores in 1937, including *Phyllachora* [*Dothidella*] *trifolii* [*R.A.M.*, xiv, p. 367] on *Trifolium ligusticum* and *T. scabrum*. Eight of the species enumerated are new to the Azores, bringing the total number of records for these islands to 54.

Ito (S.) & Imai (S.). **Fungi of the Bonin Islands. V.**—*Trans. Sapporo nat. Hist. Soc.*, xvi, 3, pp. 120–138, 1940.

This is an annotated list of 56 fungi, chiefly Polyporaceae, found, mostly on living or dead wood, in the Bonin Islands, and including a number of new species and combinations, and one new genus.

Wallace (J. M.). **Evidence of the passive immunization of Tobacco, Nicotiana tabacum, from the virus of curly top.**—*Phytopathology*, xxx, 8, pp. 673–679, 1 fig., 1940.

This is an expanded account of the writer's experiments in California on the passive immunization of Turkish tobacco plants against the curly top virus, a preliminary note on which has already appeared [*R.A.M.*, xix, p. 304]. Intensive studies over a protracted period are stated to have afforded no proof that the infectivity of the virus is in any degree impaired by passage through the insect vector [*Eutettix tenellus*].

Smith (K. M.) & MacClement (W. D.). **Filtration studies on Nicotiana virus 11.**—*Parasitology*, xxxii, 3, pp. 320–332, 1 pl., 7 graphs, 1940.

The authors state that the results obtained over a period of several years by ultrafiltration studies on 17 plant viruses have shown that only tomato bushy stunt and tobacco ring spot viruses behave similarly to the animal viruses studied by Elford [*R.A.M.*, xii, p. 646]. The filtration end points of these two viruses were constant and the results indicated them to be monodisperse suspensions of spherical particles being filtered under optimum conditions. The remainder of the plant viruses studied showed divergence to a greater or less degree from this type of

result and the present paper gives a detailed account of the filtration behaviour of tobacco necrosis virus. The filtration curves obtained by plotting the number of local lesions obtained on French bean (*Phaseolus vulgaris*) against the average pore diameter of the filters (which ranged from 250 to 40 mμ (the filtration end point of the virus), instead of indicating a regular fall in the local lesion count, exhibited a horizontal or slightly rising section between approximately 150 and 65 mμ. Various experiments designed to elucidate this peculiarity in the filtration behaviour are described and the most plausible explanation is considered to be that large virus particles are in process of breaking up into smaller ones, the former being aggregates of the latter. The particle size is computed from the filtration end point to be between 13 and 20 mμ [ibid., xix, p. 669].

THUNG (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1938–1939. [Annual report for 1938–9.]—*Meded. Proefst. vorstenl. Tab.* 88, pp. 24–28, 1940.

The results of experiments in 1938 to determine the respective effects on cured Chl[orina] $\times$KW 10 tobacco, inoculated when the plants were a foot ['een voet'] high, of ordinary and mild mosaic in a Vorstenland (Java) plantation [*R.A.M.*, xviii, p. 554] indicated that the former causes a heavy reduction in the percentages of first and second lengths (from 74 for the sound product to 12 in the first harvest, from 90 to 14 in the second, and from 71 to 2 in the third), and first and second grades (from 31 to 9, 17 to nil, and 26 to 6 in the first, second, and third harvests, respectively). The influence of mild mosaic on these characters was relatively slight, the greatest reduction both in length (from 74 to 51 per cent.) and in quality (from 31 to 27 per cent.) occurring in the first harvest.

The colour of the tobacco was also adversely affected by the viruses, ordinary mosaic in particular causing a large increase in the percentage of dun-coloured material (from 34 to 74, 13 to 87, and 16 to 72 in the first, second, and third harvests, respectively). Mild mosaic produced a very detrimental effect on smoking quality.

In a test to ascertain the feasibility of reducing the amount of sulphur applied against mildew [*Erysiphe cichoracearum*: ibid., xviii, p. 555] from 2 to 1 picol [1 picol = 0·6749 q.] per bouw [1 bouw = 0·71 ha.], the larger amount gave noticeably better results in the second harvest only, 81·5 per cent. of the plants in which were healthy compared with 73·4 and 57·8 of those receiving the smaller quantity and no sulphur, respectively.

JOHNSON (E. M.) & VALLEAU (W. D.). **Infectivity of Tobacco mosaic virus in liquids over 14 years old.**—*Phytopathology*, xxx, 8, pp. 697–698, 1940.

In January and February, 1940, the writers tested five tobacco mosaic extracts stored in Erlenmeyer flasks since 1925, together with a fresh one, on half leaves of a white Burley tobacco hybrid containing the necrotic factor from *Nicotiana glutinosa*. The average numbers of lesions per half leaf obtained with the different extracts were as follows: (1) frozen mosaic suckers from the field, ground to pulp and mixed with

water, 0·28; (2) air-dried mosaic tobacco leaves crushed and water added, 0·22; (3) suspension of mosaic green leaves ground to a pulp and mixed with water, 5 c.c. benzene added to 200 c.c., 65; (4) and (5) as (3) with the addition of xylene and toluene, respectively, 80 and 1, respectively; (6) fresh extract, 202. In order to avoid any risk of confusion with chemical injury, isolated necrotic spots were removed with a cork borer, crushed in M/10 disodium phosphate, and rubbed on tobacco leaves with a glass spatula, when mottling developed in five to seven days on all the inoculated plants. Benzene and xylene appear to be satisfactory preservatives for tobacco mosaic virus extracts where cold storage facilities are not available.

Stevens (N. E.) & Ayres (J. C.). **The history of Tobacco downy mildew in the United States in relation to weather conditions.**—*Phytopathology*, xxx, 8, pp. 684–688, 1 graph, 1940.

Downy mildew of tobacco (*Peronospora tabacina*) [*R.A.M.*, xix, p. 679] having now been more or less abundantly present in commercial plantings in the United States every year since 1931, before which it had appeared only once in a mild form in Florida and Georgia in 1921, the weather conditions prevailing during the period under review are analysed for their possible bearing on the problem of the origin of the fungus, whether endemic or introduced. Between 1932 and 1939, 1937 was the most favourable year for the development of infection, with 1932 probably second. There is no evidence to indicate that the aggressiveness of the pathogen has fluctuated, or that methods of tobacco cultivation have differed, so that meteorological factors would seem to be responsible for the erratic seasonal behaviour of the disease. A comparison of the temperature and rainfall data for Quincy, Florida, from 1920 to 1939, inclusive, lends no support to the theory that the fungus was present in a quiescent state from 1922 to 1930 and resumed an active form in 1931 with the onset of favouring weather conditions, a more reasonable conclusion, in the writers' opinion, being that the 1931 outbreak represents a fresh introduction from some external source, the 1921 epidemic having failed to lead to the establishment of the pathogen.

Anderson (P. J.). **Control of downy mildew (on Tobacco seedlings).**—*Bull. Conn. agric. Exp. Sta.* 433, pp. 193–206, 1940. [Abs. in *Chem. Abstr.*, xxxiv, 18, p. 6403, 1940.]

The best control of downy mildew of tobacco [*Peronospora tabacina*: see preceding abstract] in Connecticut was obtained by gassing the beds with either benzene or para-dichlorobenzene [*R.A.M.*, xix, p. 619], a minimum concentration of 0·06 per cent. of the former for several hours being requisite. The results given by para-dichlorobenzene were excellent, especially in warm weather, benzene being more reliable when the night temperature drops below 45° F. As little as $\frac{1}{8}$ oz. para-dichlorobenzene per sq. yd. of soil surface prevented infection. The use of medium- to small-sized crystals is recommended, the larger ones evaporating too slowly to be effective [ibid., xix, p. 618].

MOSES (C. S.) & HOFFMANN (C. H.). **Isolation of Ceratostomella ulmi from Scolytus multistriatus adults stored at different temperatures.**—*Phytopathology*, xxx, 8, pp. 701–702, 1940.

Adults of *Scolytus multistriatus* were contaminated with *Ceratostomella ulmi* [*R.A.M.*, xix, p. 680] and placed in gelatine capsules, which were mixed and divided into 22 lots of 50 each. Two were cultured immediately by a modification of Walter's method (*Phytopathology*, xxv, 1, pp. 37–38, 1935), and four stored at each of the temperatures 70°, 60°, 40°, 28°, and −10° F., one lot from each condition being removed and cultured at the end of 30, 60, 90, and 120 days, respectively. *C. ulmi* was recovered from all the beetles cultured immediately, and from all but two of the ten lots cultured 30 and 60 days after storage. At the end of 90 days only 60 per cent. of the beetles stored at 70° and 58 per cent. of those kept at 60° yielded the fungus, the corresponding figures after 120 days being 0 and 22 per cent., respectively. The pathogen was isolated, however, from all the insects stored at the lower temperatures for 90 or 120 days. In three supplementary lots of *S. multistriatus* stored at −10° the percentages of recovery of *C. ulmi* after 1, 1½, and 2½ years were 100, 98, and 100 per cent., respectively. Storage at −10° was uniformly most satisfactory as regards rapidity of coremial growth and freedom from contaminants.

SEELER (E. V.). **Two diseases of Gleditsia caused by a species of Thyronectria.**—*J. Arnold Arbor.*, xxi, 3, pp. 405–427, 4 pl., 1940.

Thyronectria austro-americana (Speg.) Seeler n. comb. (*Pleonectria austro-americana* Speg., formerly erroneously referred to *Thyronectria denigrata* (Winter) Seaver [*R.A.M.*, xviii, p. 489]), is stated to be responsible for two diseases of *Gleditsia* [*Gleditschia*], namely, a rapid wilt of *G. japonica* at the Arnold Arboretum and a canker of *G. triacanthos* on Nantucket Island. Collections of the fungus were obtained from localities extending over an area from Nebraska to Massachusetts and southward to the Gulf States.

The disease of *G. japonica* is characterized by the sudden wilting of all the foliage in the spring, or yellowing and shedding of the leaflets to the point of total defoliation in later attacks; excessive flower production and fruit setting; bands and spots of reddish-orange discolorations in the sapwood under the bark; and the presence of slender, hyaline strands of mycelium and minute, unicellular conidia in the open vessels of the current ring of wood. Affected trees are killed in a single season. The symptoms of the relatively slow-acting disease of *G. triacanthos* consist of elongated, slightly sunken bark cankers, girdling the branches and causing yellowing and gradual defoliation and death; reddish-orange bands in the wood delimiting the cankered zones; and a profusion of hyaline mycelium in the wood directly underlying the cankers. On both hosts the fructifications of the pathogen soon appear on the surface of the dead bark, the yellowish-brown pycnidia arising on the stromata extruded through the lenticels being replaced in about 1½ years by perithecia. Ascospores were shown to be forcibly expelled from the asci for about 2 mm. into the air, indicating the importance of air currents in the distribution of the fungus.

Healthy two-year-old seedlings of *G. japonica* inoculated with pure

cultures of *T. austro-americana* developed the typical symptoms of sudden wilt, whereas those of *G. triacanthos* exhibited the high degree of resistance anticipated from observations on these trees in nature. Retrocultures from *G. japonica* consistently yielded the original fungus. In culture good growth was obtained on a number of standard media, notably potato dextrose agar; of the twig substrata used, a preference was shown for *Gleditschia*, *Ulmus*, *Fraxinus*, and *Gymnocladus* in the order named.

Sokoloff (D. V.). Итоги фитопатологической экспертизы древесных семян на Ленинградской Семенной Контрольной Станции. [The results of the phytopathological examination of tree seeds at the Leningrad Seed Control Station.]—*Лесное хозяйство* [*Forest Husbandry*], *1940*, 4, pp. 34–37, 1 graph, 1940.

From 326 samples of tree seeds examined during 1938 at the Leningrad Seed Control Station, 53 species of fungi were isolated on malt agar in Petri dishes. Noteworthy among the 48 species found on broad-leaved trees are *Coniothyrium olivaceum*, *Phoma samorarum*, *Pythium de Baryanum*, *Rhytisma acerinum*, *Sclerotinia pseudotuberosa* [*R.A.M.*, xviii, p. 572], and *S. betulae*, and among the 28 on conifers, *Botrytis cinerea* and *Dematium* [*Pullularia*] *pullulans*, species of *Alternaria* and *Fusarium* occurring in both groups. Of the parasitic fungi, species of the two last-named genera were the most frequently found, *Fusarium* being present in 29, 52, 80, 9, 16, and 0 per cent., of the seed samples of American ash, American maple, oak, pine, birch, and common ash, respectively, and *Alternaria* in 71, 73, 60, 3, 0, and 33 per cent., respectively, of the same samples. *Sclerotinia* [unspecified] was found in all the five samples of oak seeds tested. *Trichothecium roseum* was frequently present on the seeds of conifers and caused a dying-off of the tips of pine and fir seedlings.

Baraney (A. V.). Ложный рак Ясеня. [Pseudo-canker of Ash.]—*Лесное хозяйство* [*Forest Husbandry*], *1940*, 4, pp. 50–52, 3 figs., 1940.

A disease of common ash, caused by a fungus identified by A. S. Bondartzeff as *Endoxylina astroidea* Fr., is recorded for the first time from the U.S.S.R., though the disease is thought to have been present for 30 to 35 years. It is stated to be fairly widespread in the stands of the Vladimirsk experimental centre and other localities in the steppe belt. The fungus [for a description of which the reader is referred to Romell, *Bot. Notiser*, 1892] causes a rot of the pith, which, when the tree is felled, appears in the transverse sections of the trunk as a dark brown, irregular patch with light grey, oblong lesions in it. The rot usually comes to the surface of the stem, where the branches die and break off. Around such places the cambium and the bark soon die and characteristic canker-like lesions develop after the bark falls off. The disease cannot, however, be placed in the canker group, as the rot is not localized but spreads through the whole stem and roots. The coal-black fruit bodies of the fungus appear one or two years after the bark has fallen off. The results of inoculation experiments, conducted during 1938 and 1939, showed that infection takes place through wounds caused by insects or by the breaking-off of branches. The rot

usually starts at a height of about 1 to 1·5 m. and reaches the roots after about 10 to 15 years. Shoots growing from old infected stumps are usually invaded by the fungus from the stump. The disease is more prevalent in stands grown on high and dry ground, where the trees are not vigorous, than in low and moist situations. This fact is important for the choice of localities for new ash plantations. In established stands trees should be examined for the presence of fruit bodies of the fungus and infected ones felled and removed together with old infected stumps.

COLE (J. R.). **Résumé of five years' spraying with low-lime Bordeaux mixture and zinc sulphate to control Pecan scab and rosette diseases.** —Abs. in *Phytopathology*, xxx, 8, p. 704, 1940.

Satisfactory control of pecan scab (*Cladosporium effusum*) [*R.A.M.*, xix, p. 571] was obtained from 1935 to 1939 in south Georgia by four applications of Bordeaux mixture at three- to four-weekly intervals between 10th to 20th April and mid-July, using a concentration of 4–1–100 for the first treatment and 6–2–100 for the later ones. During the period under review, the sprayed trees yielded an average of 55 lb. good-quality nuts, compared with only 10 lb. low-grade from the controls. Rosette [loc. cit.] may be simultaneously combated by the addition of 2 lb. zinc sulphate (analysing approximately 36 per cent. zinc) to the last three Bordeaux treatments, the disease having been completely overcome in two years by this method, and its appearance prevented by the annual admixture of the compound with any of the three final applications.

BOYCE (J. S.). **A needle-cast of Douglas Fir associated with Adelopus gäumanni.**—*Phytopathology*, xxx, 8, pp. 649–659, 2 figs., 1940.

This is a critical survey of the available knowledge concerning the needle cast of Douglas fir (*Pseudotsuga taxifolia*) caused by *Phaeocryptopus gaeumanni*. The change in the character of the fungus from a virtually harmless parasite in its native environment in the western United States and Canada [*R.A.M.*, xviii, p. 425] to a virulent pathogen in the north-eastern States [ibid., xix, p. 247] and Europe [ibid., xix, pp. 177, 506, *et passim*] is attributed to the fact that in the latter regions the host is an exotic and consequently predisposed to disease, while the climatic conditions of its new habitats tend to favour the development of the fungus.

Government of India. Department of Education, Health and Lands. Notification. Agriculture.—4 pp., 1940.

Notification No. F. 30–7/37 of 7th June, 1940, introduces the following amendments to that of 20th July, 1936 (No. F. 320/35–A) relating to restrictions on the importation of plants [*R.A.M.*, xvi, p. 496]: the substitution of the name *Fomes lignosus* for *F. semitostus* and of *Dothidella ulei* (= *Melanopsammopsis ulei* = *Fusicladium macrosporum*) for *F. macrosporum* [pathogens of *Hevea* rubber for which certificates of exemption are required]; and of '*Ceratostomella paradoxa* or *Thielaviopsis paradoxa*' for '*T. paradoxa*' [sugar-cane]. A list is given of the countries to which the regulations apply, with the responsible authorities concerned in their administration.

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